VOLUME 17 / NUMBER 23
DECEMBER 8, 1979
ACC. NOS. N79-32150 TO N79-33151

STAR
AN ABSTRACT JOURNAL

Scientific and Technical Aerospace Reports

PRODUCED BY THE
SCIENTIFIC AND TECHNICAL
INFORMATION
BRANCH

NASA

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WHAT YOU CAN DO FOR *STAR*

All users of this abstract service are urged to forward reports to be considered for announcement in *STAR*. This will aid NASA in its efforts to provide the fullest possible coverage of all scientific and technical publications that might support aeronautics and space research and development. If you have prepared relevant reports (other than those that you will transmit to NASA, DoD, or DOE through the usual contract- or grant-reporting channels), please send them for consideration to the NASA Scientific and Technical Information Facility, P. O. Box 8757, B. W. I. Airport, Maryland 21240.

Reprints of journal articles, book chapters, and conference papers are also welcome. These will be considered for announcement in *STAR's* companion journal, *International Aerospace Abstracts*.

You may specify a particular source to be included in a report announcement if you wish; otherwise the report will be placed on public sale at the National Technical Information Service. Copyrighted publications will be announced but not distributed or sold.

PURCHASE OF *STAR*

The semimonthly issues and the cumulative index issues are available postpaid on subscription and in single copy from the Superintendent of Documents, United States Government Printing Office, Washington, D.C., 20402, United States of America.

Semimonthly issues...

Annual subscription rates: $60.00 domestic; $75.00 foreign. Price per single copy: $2.50 domestic; $3.15 foreign.

Cumulative index issues, semiannual and annual ...

Annual subscription rates for both: $25.00 domestic; $31.25 foreign. Price per single copy: semiannual $9.50 domestic, $11.90 foreign; annual $16.00 domestic, $20.00 foreign.

Domestic subscription rates...

Apply to the United States, Canada, Mexico, and all Central and South American countries, except as noted below.

Foreign subscription rates...

Apply to Argentina, Brazil, French Guiana, Guyana, Surinam, Belize, and all other countries throughout the world.

Payment should be by check, money order, or document coupons, and must accompany order. Remittances from foreign countries should be made by international money order or draft on an American bank, payable to the Superintendent of Documents, or by UNESCO book coupons.

PUBLISHED BY:

UNITED STATES GOVERNMENT
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SCIENTIFIC AND TECHNICAL INFORMATION BRANCH
Scientific and Technical Aerospace Reports, Volume 17, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by Informatics Information Systems Company.

The Administrator of the National Aeronautics and Space Administration has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through June 30, 1981.

US ISSN 0036-8741

INTRODUCTION

Scientific and Technical Aerospace Reports (STAR) is a major component of a comprehensive National Aeronautics and Space Administration information system covering aeronautics, space, and supporting disciplines. *STAR* is issued on the 8th and 23rd of each month and announces current publications of the following types:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institutions, universities, and private firms
- Translations in report form
- NASA-owned patents and patent applications
- Dissertations and theses

Cumulative index volumes are published semiannually and annually.

Journal, book, and conference literature, cover-to-cover journal translations, and certain foreign dissertations are announced in a companion journal, *International Aerospace Abstracts (IAA)*, available on subscription from the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, New York 10019.

ON-GOING RESEARCH PROJECTS

By arrangement between NASA and the Smithsonian Science Information Exchange (SSIE), a separate section of information on aerospace-related *On-Going Research Projects* is inserted into each issue of *STAR*. The insert presents titles of active NASA grants and university contracts, summary portions of recently updated *NASA Research and Technology Objectives and Plans (RTOPs)*, and notices of non-NASA research projects that were funded in the most recent or current fiscal year. The latter are selected by SSIE. The project announcements in the insert are arranged by *STAR* divisions but are otherwise entirely separate from *STAR*. They are not indexed nor machine-searchable by NASA. Current and retrospective searches are available from SSIE, 1730 M Street, N.W., Washington, D.C. 20036.

SUBJECT SCOPE

Subject scope of *STAR*, *IAA*, and *On-Going Research Projects* includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

OTHER NASA PUBLICATIONS

Other NASA publications and information services are described in the publication, *The NASA Scientific and Technical Information System ... and How to Use It*, available without charge from the NASA Scientific and Technical Information Facility, P. O. Box 8757, B. W. I. Airport, Maryland 21240.

HOW TO USE STAR SUBJECT CATEGORIES

STAR is categorized by 10 major subject divisions divided into 74 specific subject categories and one general category/division. The major subject divisions are listed in the Table of Contents, together with a note for each that defines its scope and provides any cross-references. For example:

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

Each major division is further divided into as many as nine specific categories, which are identified by category numbers.

Abstracts in *STAR* are grouped by specific category, the categories appearing in sequential order. Category breaks in the abstract section are identified by the category number and title, and a scope note. Cross-references to other categories are provided as appropriate. For example:

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

CROSS-REFERENCES

Individual *STAR* abstracts are not ordinarily cross-referenced, except for certain conference reports or book translations that have had separate abstracts written for their component papers or chapters. Citations and abstracts of the components follow immediately after those of the parent document. When the subject content of a component differs sufficiently from the general content of the parent, a cross-reference citation also is printed at the end of the category to which it normally would have been assigned if it were independent.

DOCUMENTS ON MICROFICHE

Documents on microfiche[1] are designated by a pound sign (#) following the accession number. The pound sign is used without regard to the source or quality of the microfiche.

AVAILABILITIES

One or more sources from which a document announced in *STAR* is available to the public is given in each citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

(1) A microfiche is a transparent sheet of film, 105 by 148 mm in size, containing as many as 60 to 98 pages of information reduced to micro images (not to exceed 26:1 reduction).

Avail: NTIS. Sold by the National Technical Information Service. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page vii.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Section, Springfield, Va. 22161.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the * symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report* number shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, at the standard $3.00 price, for those documents identified by a # symbol.)

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Documents Room (Room 126), 600 Independence Ave., S.W., Washington, D.C. 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts*. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center - Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this Introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, California. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: Fachinformationszentrum, Karlsruhe. Sold by the Fachinformationszentrum Energie, Physik, Mathematik GMBH, Eggenstein Leopoldshafen, Federal Republic of Germany, at the price shown in deutschmarks (DM).

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: U.S. Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of 50 cents each, postage free. (See discussion of patents and patent applications below.)

NASA PATENTS AND PATENT APPLICATIONS

Patents and patent applications owned by NASA are announced in *STAR* under appropriate subject categories and are referenced in the *STAR* indexes. In the Report/Accession Number Index, patents are indexed by the NASA Case Number (which appears in lieu of the report number in other indexes), the U.S. Patent Number, the U.S. Patent Application Serial Number, and the U.S. Patent Class. Patent applications for which patents have not yet been issued are indexed by the NASA Case Number and the U.S. Patent Application Serial Number.

NASA *patent application specifications* are sold in paper copy by the National Technical Information Service at price code A02 ($4.00 domestic, $8.00 foreign). Microfiche are sold at price code A01 ($3.00 domestic; $4.50 foreign). The US-Patent-Appl-SN- number should be used in ordering either paper copy or microfiche from NTIS. Printed copies of *patents* (which are not microfiched) are available for purchase at 50 cents per copy from:

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, D.C. 20231

When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, preferably by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the Patent and Trademark Office. The patents and patent applications announced in *STAR* are owned by NASA and are available for royalty-free licensing. Requests for licensing terms and further information should be addressed to:

Assistant General Counsel for Patent Matters/Code GP-1
National Aeronautics and Space Administration
Washington, D.C. 20546

ELIGIBILITY AND REGISTRATION FOR NASA INFORMATION PRODUCTS AND SERVICES

A variety of services, in addition to the distribution of NASA scientific and technical reports and of *STAR* and its cumulative indexes, is available to organizations of the following types that have registered with NASA to receive specific services or products:

1. NASA offices, research centers, contractors, subcontractors, grantees, and consultants;

2. Other U.S. Government agencies and their contractors;
3. Libraries in the United States that have arrangements with NASA to maintain collections of NASA documents for public reference;
4. Other organizations in the United States having a need for NASA documents in work related to aeronautics and space research;
5. Organizations abroad that have established reciprocal document exchange arrangements with NASA.

Only the central service points or central points of document acquisition and control within qualified organizations are eligible to register for NASA products and services. Domestic organizations that may be eligible to receive various classes of NASA publications and services should address their requests for registration or for further information to:

NASA Scientific and Technical Information Facility
Attn.: Registration Activity
P.O. Box 8757
B.W.I. Airport, Maryland 21240

Organizations abroad should direct requests to the same address, but to the attention of: Foreign Exchange and Acquisitions Branch.

AVAILABILITY OF STAR ABSTRACTS ON MICROFICHE

Microfiche of the abstract sections of this issue and other issues of *STAR* are available on annual subscription from NTIS, Attn: Subscriptions, 5285 Port Royal Road, Springfield, Virginia 22161. Annual subscription rates are $45.00 North America; $90.00 foreign. Abstract sections for previous years retroactive to 1964 are available at the current rates. Microfiche for individual *STAR* issue abstract sections are not available.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics
and Astronautics
Technical Information Service
555 West 57th Street, 12th Floor
New York, New York 10019

British Library Lending Division,
Boston Spa, Wetherby, Yorkshire,
England

Commissioner of Patents and
Trademarks
U.S. Patent and Trademark Office
Washington, D.C. 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830

ESA-Information Retrieval Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Scientific and Technical Information
Facility
P.O. Box 8757
B. W. I. Airport, Maryland 21240

National Aeronautics and Space
Administration
Scientific and Technical Information
Branch (NST-41)
Washington, D.C. 20546

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, California 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey
1033 General Services Administration
Building
Washington, D.C. 20242

U.S. Geological Survey
601 E. Cedar Avenue
Flagstaff, Arizona 86002

U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

U.S. Geological Survey
Bldg. 25, Denver Federal Center
Denver, Colorado 80225

Fachinformationszentrum Energie, Physik,
Mathematik GMBH
7514 Eggenstein Leopoldshafen
Federal Republic of Germany

NTIS PRICE SCHEDULES

Schedule A

STANDARD PAPER COPY PRICE SCHEDULE

(Effective October 1, 1977)

Price Code	Page Range	North American Price	Foreign Price
A01	Microfiche	$ 3.00	$ 4.50
A02	001-025	4.00	6.00
A03	026-050	4.50	9.00
A04	051-075	5.25	10.50
A05	076-100	6.00	12.00
A06	101-125	6.50	13.00
A07	126-150	7.25	14.50
A08	151-175	8.00	16.00
A09	176-200	9.00	18.00
A10	201-225	9.25	18.50
A11	226-250	9.50	19.00
A12	251-275	10.75	21.50
A13	276-300	11.00	22.00
A14	301-325	11.75	23.50
A15	326-350	12.00	24.00
A16	351-375	12.50	25.00
A17	376-400	13.00	26.00
A18	401-425	13.25	26.50
A19	426-450	14.00	28.00
A20	451-475	14.50	29.00
A21	476-500	15.00	30.00
A22	501-525	15.25	30.50
A23	526-550	15.50	31.00
A24	551-575	16.25	32.50
A25	576-600	16.50	33.00
A99	601-up	-- 1/	-- 2/

1/ Add $2.50 for each additional 100 page increment from 601 pages up.

2/ Add $5.00 for each additional 100 page increment from 601 pages up.

Schedule E

EXCEPTION PRICE SCHEDULE

Paper Copy & Microfiche

Price Code	North American Price	Foreign Price
E01	$ 3.25	$ 6.50
E02	4.75	9.50
E03	6.25	12.50
E04	7.50	15.00
E05	9.00	18.00
E06	10.50	21.00
E07	12.50	25.00
E08	15.00	30.00
E09	17.50	35.00
E10	20.00	40.00
E11	22.50	45.00
E12	25.00	50.00
E13	28.00	56.00
E14	31.00	62.00
E15	34.00	68.00
E16	37.00	74.00
E17	40.00	80.00
E18	45.00	90.00
E19	50.00	100.00
E20	60.00	120.00
E99 - Write for quote		
N01	28.00	40.00

VOLUME 17 NUMBER 23 / DECEMBER 8, 1979

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 3035

02 AERODYNAMICS 3035

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

03 AIR TRANSPORTATION AND SAFETY 3039

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 3040

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 3042

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION 3043

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER 3044

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL 3045

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 3045

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*.

12 ASTRONAUTICS (GENERAL) 3046

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS N.A.

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) N.A.

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air)*.

15 LAUNCH VEHICLES AND SPACE VEHICLES 3050

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 3051

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING 3052

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 3052

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

19 SPACECRAFT INSTRUMENTATION N.A.
For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

20 SPACECRAFT PROPULSION AND POWER 3052
Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.
For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

23 CHEMISTRY AND MATERIALS (GENERAL) 3053
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 3053
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 3057
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics*.

26 METALLIC MATERIALS 3060
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 3065
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 3068
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion*.

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
For related information see also *Physics*.

31 ENGINEERING (GENERAL) 3071
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 3072
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

33 ELECTRONICS AND ELECTRICAL ENGINEERING 3080
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

34 FLUID MECHANICS AND HEAT TRANSFER 3084
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

35 INSTRUMENTATION AND PHOTOGRAPHY 3088
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation*.

36 LASERS AND MASERS 3090
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 3092
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 3093
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 3094
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
For related information see also *Space Sciences*.

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES 3099
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

44 ENERGY PRODUCTION AND CONVERSION 3102
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels*, and *85 Urban Technology and Transportation*.

45 ENVIRONMENT POLLUTION 3116
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 3118
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation*.

47 METEOROLOGY AND CLIMATOLOGY 3123
Includes weather forecasting and modification.

48 OCEANOGRAPHY 3125
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) 3126
Includes genetics.

52 AEROSPACE MEDICINE 3127
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES 3127
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 3129
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY N.A.
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) N.A.

60 COMPUTER OPERATIONS AND HARDWARE 3130
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

61 COMPUTER PROGRAMMING AND SOFTWARE 3132
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS 3136
Includes computer networks.

63 CYBERNETICS 3136
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support*.

64 NUMERICAL ANALYSIS 3138
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 3143
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 3145
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS 3145
Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering*.

70 PHYSICS (GENERAL) 3146
For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar Physics*.

71 ACOUSTICS 3146
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS 3147
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 3149
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS 3152
Includes light phenomena.

75 PLASMA PHYSICS 3154
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS 3159
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS 3162
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) N.A.
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT 3163
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 3163
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 3164
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 3165

89 ASTRONOMY 3165
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 3167
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 3168
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 3169
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 3170
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

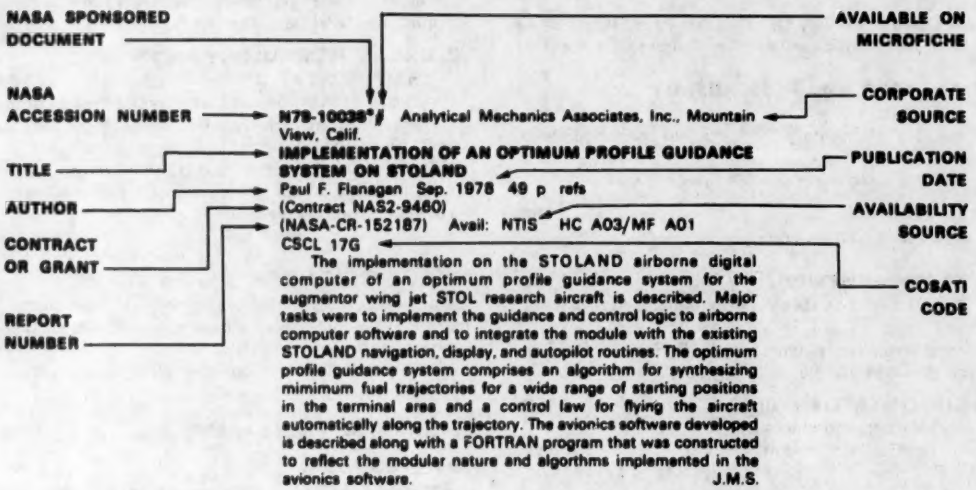
GENERAL

99 GENERAL 3170

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-53
CORPORATE SOURCE INDEX I-59
CONTRACT NUMBER INDEX I-73
REPORT/ACCESSION NUMBER INDEX I-77

TYPICAL CITATION AND ABSTRACT


NASA SPONSORED DOCUMENT
AVAILABLE ON MICROFICHE
NASA ACCESSION NUMBER
N79-10038*# Analytical Mechanics Associates, Inc., Mountain View, Calif.
CORPORATE SOURCE
TITLE
IMPLEMENTATION OF AN OPTIMUM PROFILE GUIDANCE SYSTEM ON STOLAND
PUBLICATION DATE
AUTHOR
Paul F. Flanagan Sep. 1978 49 p refs
CONTRACT OR GRANT
(Contract NAS2-9460)
AVAILABILITY SOURCE
REPORT NUMBER
(NASA-CR-152187) Avail: NTIS HC A03/MF A01
C5CL 17G
COSATI CODE
The implementation on the STOLAND airborne digital computer of an optimum profile guidance system for the augmentor wing jet STOL research aircraft is described. Major tasks were to implement the guidance and control logic to airborne computer software and to integrate the module with the existing STOLAND navigation, display, and autopilot routines. The optimum profile guidance system comprises an algorithm for synthesizing mimimum fuel trajectories for a wide range of starting positions in the terminal area and a control law for flying the aircraft automatically along the trajectory. The avionics software developed is described along with a FORTRAN program that was constructed to reflect the modular nature and algorithms implemented in the avionics software.
J.M.S.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, MAINTENANCE AND DIAGNOSTICS LOGIC MODEL
R.A. DePaul, Detex Systems Inc., *17871 Santiago Blvd., Villa Pk. Suite 221, Orange, California* 92667 (DA0C3522; NAS PR A10240B)

The objectives are to investigate the feasibility of utilizing an advanced logic model and to develop a maintenance logic model for performing diagnostics and fault isolation of helicopter components.

The approach taken is to identify methodology for describing the functional and physical relationship of designed hardware by identifying appropriate dependency chains and utilizing such design variables as test points and feedback conditions to create a logic model useful to repairmen and maintenance specialists which will also be useful as a design evaluation tool for ease of maintenance and repair.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Air Mobility Research & Development Lab.

1.0002, INTEGRATED HINGE (ROTARY) ELECTROMECHANICAL ACTUATION DEVICE
N.E. Wood, Garrett Corp., *2525 W. 190th St., Torrance, California* 90509 (DF136740; F33615-76-C-3043)

This program supports flight control actuation for all future Air Force aircraft, manned and unmanned. Hydraulic systems used for flight control actuation on aircraft have become very costly to design, develop, and maintain. Further, there is a continual increase in electrical power needs that have been accelerated by fly-by-wire and the increasing use of avionics. It would be extremely desirable if the electrical power systems that must be available in any case could be expanded to also do actuation, thus permitting the removal of on-board hydraulic systems. The objective of this effort is to demonstrate the credibility of electromechanical actuation as an alternative to conventional hydraulic actuation. Successful demonstration will set the stage for combining 'power-by-wire' with 'fly-by-wire' on future Air Force aircraft and permitting the removal of the high-cost hydraulic systems. Emphasis is on reducing cost for equivalent performance.

The most promising electromechanical actuator configuration defined under work unit 19870153 will be selected for fabrication. Bench-testing of the electromechanical actuation will parallel the type of testing that is now specified for hydraulic actuation of primary control surfaces. Typical frequency response tests will be run with the surface inertia and aerodynamic loads carefully represented. Power-in vs power-out efficiency, thermal characteristics, and failure modes will be evaluated. Particular attention will be given to establishing a mission duty cycle because all extrapolation for electromechanical actuation use from airplanes to RPV's to missiles is intensely dependent on the duty cycle.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0003, NAVTOLAND (NAVY VERTICAL TAKEOFF AND LANDING) CONTROL DISPLAY CAPABILITY
R. Ringland, Systems Technology Inc., *13766 S. Hawthorne Blvd., Hawthorne, California* 90250 (DN881385; N62269-77-C-0230)

To analyze the tradeoffs between flight control and display complexity for V/STOL shipboard landings, and recommend optimum configurations. This contract supports work unit ZA601, Agency Accession No. DN681080.

Through literature searches and evaluation of flight test data, develop a matrix of feasible and practicable control/display configurations. Preliminary examination of the V/STOL terminal area mission phase breakdown has been initiated.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0004, COMPLIANT ROTOR MISSION ANALYSIS
R.H. Blackwell, United Technologies Corp., Sikorsky Aircraft Division, *N. Main St., Stratford, Connecticut* 06602 (DA0E3775; DAAJ02-77-C-0041)

To determine the mission effectiveness of a compliant rotor when compared with a conventional rotor. The compliant rotor is a rotor in which the aeroelastic properties are deliberately designed so that the inherent dynamics response of the rotor system will result in improved rotor operational qualities.

A series of missions will be selected for a mission effectiveness study on a helicopter with a compliant rotor. A baseline conventional rotor (UH-60A) will be used in conjunction with a compliant rotor to determine the benefits to be derived from compliant rotor technology.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Air Mobility Research & Development Lab.

1.0005, UTTAS EXTERNAL CARGO TERRAIN FLYING EQUIPMENT
T. Garnett, United Technologies Corp., Sikorsky Aircraft Division, *N. Main St., Stratford, Connecticut* 06602 (DA0E3792; DAAJ02-77-C-0067)

To improve the capability of single suspension point helicopters in performing external load missions under terrain flying conditions.

A preliminary design of a system for converting a single point suspension system to a multi-point tandem system with minimum aircraft modifications and dedicated weight will be formulated using the UTTAS as a base. The design will be subjected to analysis to define and quantify parameters affecting both aircraft and mission performance.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0006, AIRSPACE MANAGEMENT
J.F. Gilsinn, U.S. Dept. of Commerce, National Bureau of Standards, *Washington, District of Columbia* 20228 (2050491)

PROJECT OBJECTIVE: Increasing airplane-traffic densities and a need for the most fuel-efficient traffic patterns have led the FAA to reassess present separation requirements for aircraft, and to examine the safety aspects of possible reductions. NBS will aid in evaluating the models and the data collection plan, for assessing vertical separation standards.

PROJECT APPROACH: NBS will continue investigation and evaluation of models for estimating separation risk, and will report the results. Analysis procedures for collected data will also be recommended. Continued aid will be provided to FAA in designing an adequate data-collection effort to evaluate vertical separation requirements.

PRIOR YEAR ACCOMPLISHMENTS: PI represents DOC on separation study review group of RTCA paper 'Validation of an Airport Simulation Model', Proc. 1976 Bicentennial Winter Simulation Conference, 273-277.

SUPPORTED BY U.S. Dept. of Commerce, National Bureau of Standards

1.0007, AUGMENTOR COMBUSTION INSTABILITY INVESTIGATION

J.P. Rusnak, United Technologies Corp., Pratt & Whitney Aircraft Group, *P.O. Box 2691, West Palm Beach, Florida* 33402 (DN789771; F33615-76-C-2024)

Develop a reliable analytical model to determine the rumble stability limits and characteristics of turbofan engine augmentors. A secondary objective is to model the heat realease characteristics at a flameholder subject to longitudinal pressure disturbances.

Phase I consisted of model development in which concurrent experimental and analytical studies were conducted. The model was directed toward describing the stability limits and characteristics of the experimental rig. Phase II consists of model refinement and extension. The model will be computerized and extended to other less conventional augmentors. Phase III, model evaluation, investigates stability design improvements and should establish recommended development and test criteria for future augmentor development programs.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

1.0008, FATIGUE CRACK INITIATION AND PROPAGATION OF MEMBERS SUBJECT TO VARIABLE LOADINGS

J. Morrow, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Theoretical & Applied Mechanics, *207 Engineering Hall, Urbana, Illinois* 61801 (DF139460; AFOSR-77-3195)

The determination of the economic life of aircraft structures exposed to service load histories depends on the development and verification of new techniques and fatigue analysis methods. The main objective of the proposed work is to utilize analysis capability derived from fatigue initiation models to improve crack growth modeling. These initiation models will be used in conjunction with stress/strain determination methods to establish a 'non-arbitrary initial fatigue crack size.' The return on this investment will be an improved structural life prediction capability that has the potential for implementing the economic life determination requirements of MIL-STD-1530A and MIL-SPEC-8866B.

To evaluate the concept of 'non-arbitrary initial fatigue crack size,' careful cyclic elastic-plastic finite element analyses will be conducted to define the stress strain levels and gradients for three separate notch geometries. The analytical loadings will be limited to a single overload type cycle followed by constant amplitude loadings. Fatigue crack initiation damage accumulation methods will be used in conjunction with the stress-strain results to determine the rate of change of damage with distance below the notch root. Crack propagation damage accumulation analyses will be used in conjunction with appropriate stress intensity factor relationships (that handle geometry and notch residual stress state) to determine the rate of change of damage as a function of crack length. The minimum level of the sum of the two damage rates occurs at the 'non-arbitrary initial fatigue crack size.' The analytical results will be verified by tests conducted after the results establish both the trend and magnitude of the 'non-arbitrary initial fatigue crack size' as a function of notch geometry and crack size.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0009, SYSTEMS ENGINEERING SUPPORT IN THE DEVELOPMENT AND TESTING OF THE AVIATION WEATHER SYSTEM

Unknown, Minority Services Inc., *Silver Spring, Maryland* 20910 (FA78WAI-881; FA161270 (TRAIS NO.))

The basic function of the FAA's Aviation Weather System is to provide timely, accurate and operationally meaningful weather information to the National Airspace System (NAS) and its users. The existing Aviation Weather System does not adequately meet the Agency's mission. The entire spectrum of weather-related activities, data acquisition, processing, communications and presentation performed in support of aviation, can be welded into a consolidated, cost-effective, integrated system.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0010, OMNIDIRECTIONAL LOW AIRSPEED INDICATOR

F. Hoerner, U.S. Dept. of Defense, Navy, Naval Air Test Center, *Patuxent River, Maryland* 20670 (DN793253)

Provide more sensitive low speed indicator for helicopters.

Procure improved airspeed indicator plan and conduct flight tests.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0011, NAVY VERTICAL TAKEOFF AND LANDING CAPABILITY DEVELOPMENT (NAVTOLAND)

S.L. Porter, U.S. Dept. of Defense, Navy, Naval Air Test Center, *Patuxent River, Maryland* 20670 (DN793173)

Provide flight test support to Navy's vertical takeoff and landing capability development (NAVTOLAND) program.

Provide experienced representatives at planning and review meetings; review technical reports as requested; perform flight tests of individual components and systems as directed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0012, NAVY VEHICLE DESIGN AND CONSTRUCTION - GENERIC V/STOL AIRCRAFT STABILITY AND CONTROL INVESTIGATION

S. Gully, Analytic Sciences Corp., *6 Jacob Way, Reading, Massachusetts* 01867 (DN875061; N00014-77-C-0775)

There is a continuing need to develop and apply new methods for analyzing the stability and design of the control systems of aircraft. This is especially true for Navy V/STOL aircraft especially in hover and transition to and from hover flight modes. The objective of this investigation is to apply advanced methods of analysis developed under previous ONR support to obtain a better understanding of generic V/STOL stability and control characteristics.

Using known characteristics of such V/STOL aircraft as the AV8A and AV8B, new analytical methods will be applied to predict the open loop stability boundaries of subsonic and supersonic V/STOL aircraft during hover, transition to and from hover, conventional maneuvering flight, direct lifting maneuvering flight (vectored thrust) and ground effects.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

1.0013, HINGE MOMENTS OF AN OPTIMIZED CONTROL SURFACE DESIGN

J. Greco, Raytheon Co., *Hartwell Rd., Bedford, Massachusetts* 02173 (DF139760; F33615-77-C-3029)

A number of current and future missile systems utilize tail control surfaces to produce the required stabilization and control. For high Mach number flight, the tail size requirements of each function are not complementary. The large surface area needed

for stability is more than that required for control. The split tail concept to be investigated will optimize the tail design yielding greater aerodynamic and control system efficiency. Also, it is anticipated the concept will result in a significant reduction of hinge moments which will allow utilization of lighter weight, smaller size, and lower cost actuators.

Although limited theoretical analyses have been performed, the effects of the viscous separated flow interaction between the control surfaces can only be accurately investigated experimentally. A body-tail configuration will be tested at low and high supersonic Mach numbers and six component model loads and control surface loads will be measured. This data will be used to determine the degree of optimization of the tail surface design and the associated hinge moments. Design charts will be prepared describing the performance of the split tail concept.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0014, STUDY OF THE DESIGN AND PERFORMANCE CHARACTERISTICS OF AIRCRAFT SIMULATORS

L.E. Fogarty, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Aerospace Engineering, *Ann Arbor, Michigan* 48104 (DF047810; AFOSR-77-3245)

AF function - specific means for improving simulation technology, taking into account problems of motion, visual and flight simulation, are needed to help optimize present and future Air Force simulation assets. Deficiency- specific recommendations for optimizing Air Force simulation performance characteristics are still lacking. Objective -current state-of-the-art motion system performance capabilities will be analyzed and specific recommendations will be concerning the relative improvements to be anticipated through additional engineering development efforts. How research contributes - greater training and cost effectiveness of Air Force simulators, including the ASUPT, through a systematic, in-depth and on-site review of current and planned simulation assets.

A result of 20 months of on-site in-depth study of the available and applicable technology, specific engineering development efforts to improve Air Force simulation assets will be made.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

1.0015, INVESTIGATION OF A LOW-COST SERVOACTUATOR FOR HYSAS

J.H. Lindahl, Honeywell Inc., Avionics Division, *2600 Ridgeway Parkway N.E., Minneapolis, Minnesota* 55413 (DA0D4108; DAAJ02-77-C-0025)

Feasibility investigation of a simple, low-cost fluid amplifier driven spring centered cylinder-type actuator to perform the series servoactuator function in a helicopter hydrofluidic stability augmentation system (HYSAS).

To design, fabricate, and laboratory test a simple fluid amplifier driven servoactuator to evaluate concept feasibility. The investigation will concentrate on actuator performance parameters considered essential for HYSAS operation and the design of an actuator to provide this performance level on a minimum cost per function basis.

SUPPORTED BY U.S. Dept. of Defense, Aviation Systems Command, Air Mobility Research & Development Lab.

1.0016, DIGITAL FLIGHT CONTROL SOFTWARE VALIDATION/VERIFICATION METHODOLOGY DEVELOPMENT

E.R. Rang, Honeywell Inc., *2600 Ridgeway Parkway N.E., Minneapolis, Minnesota* 55413 (DF141450; F33615-78-C-3605)

The program is in support of future advanced digital flight control systems of aerospace vehicles. Future flight control systems will be digital and to date no economical, highly effective means exist for proving the correctness of the associated software. Presently, extensive testing and simulation have been used to ensure correctness of the system software design which is expensive and inadequate for complex systems. This program is intended to provide analytical and automatic techniques to validate software design in the design phase of the development cycle of modern flight control systems. A study of existing validation techniques will be made and the most promising adapted to the design of flight control system software. The result will be a design methodology to validate flight control system software at each phase of the development cycle.

An investigation will be conducted into various software development and checkout methodologies to determine applicability to redundant flight control system software design. A disciplined software validation approach will be defined that incorporates the advantages of the investigated technologies. A methodology will be developed that aids in the design and employs as much automation as possible so as to make maximum use of the thoroughness of computerized checkout.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0017, PREFERENCE-ORDERED DISCRETE-GAMING AIR-TO-AIR COMBAT MODEL

H.J. Kelley, Analytical Mech. Assoc. Inc., *Westbury, New York* 11590 (DF141030; F33615-77-C-3144)

Military operations of fighter weapon systems impose significant technical problems from both a design and tactical standpoint. New systems are designed under the philosophy that they will control the combat arena. This levies requirements on performance from both an offensive and defensive standpoint. The objective of this effort is to develop a method for evaluating fighter weapon systems engaged in air-to-air combat for different fighter roles.

This is an analytical performance analysis of a preference-ordered discrete-gaming air-to-air combat model. A fighter's primary role is the ability to kill another fighter and the last or most undesirable role is the likelihood that he will be killed. In between are other roles that occur in combat. The first phase of this effort will consist of extending current capabilities to variable speed systems. The second phase will consist of the validation of the model and application of future weapon systems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0018, ADVANCED COMPOSITE WING COVER-TO-SUBSTRUCTURE ATTACHMENT DEVELOPMENT PROGRAM

H.H. Forsch, Grumman Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DF140120; F33615-77-C-3071)

Advanced composites exhibit considerable potential for performance and cost benefits in primary airframe members of Air Force aircraft. A key problem exists in the design and manufacture of critical structural details such as the the lower wing cover/substructure joint where it is particularly desirable to eliminate fasteners to improve structural efficiency, increase airframe life, simplify fuel sealing techniques and reduce fabrication costs. The objective of this program is to develop, evaluate and verify advanced composite structural design concepts for wet-wing military aircraft featuring non-mechanical attachment of substructure to covers, repairable fuel sealing concepts and revised low-cost final assembly procedures. Demonstration of the structural integrity of such advanced structural joints with their attendent system benefits will provide future airframe designers and producers with viable options for improving performance and reducing costs of advanced military aircraft.

Four cover-to-substructure design concepts will be designed, evaluated and compared with a typical mechanical joint designed to the same loading conditions during the first phase of this program. Approximately 81 test specimens will be tested at three temperatures to provide comparative test data, 27 each at minus 67 F, RT and 300 F. Thermoplastic resin systems will also be evaluated to provide repairable fuel tight sealing capability. Phase 2 involves design and fabrication of a 2 foot by 3 foot test box utilizing the selected concept. During Phase 3 the box will be tested under the combined effects of fuel pressure and torsion introduced by the closure ribs.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0019, COMPUTER GRAPHICS RESEARCH
C.A. Csuri, Ohio State University, Columbus Campus, School of Arts & Sciences, Dept. of Art, *190 N. Oval Dr., Columbus, Ohio* 43210 (DF140520; AFOSR-77-3346)

The use of finite-element methods for design of structural components contributes significantly to the effectiveness and efficiency of flight vehicles. STAGING (structural analysis via generalized interactive graphics) is being developed to assist in using the finite-element programs more effectively. There is a need to explore new graphic techniques to support the STAGING effort. The objective of this effort is to investigate incorporating advanced computer graphics concepts into STAGING.

A preliminary investigation has revealed that significant advances have been made in model generation, languages to easily define spacio-temporal models, hidden line removal, and dynamic picture processing. The approach is to further evaluate these capabilities to determine their impact on STAGING, accelerate the development of the most promising areas, and begin the transition of capabilities into STAGING.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0020, A PARAMETRIC STUDY OF HEAT TRANSFER ANALYSIS OF COMPOSITE STRUCTURES
L.S. Han, Ohio State University, Columbus Campus, School of Engineering, Dept. of Mechanical Engineering, *190 N. Oval Dr., Columbus, Ohio* 43210 (DF142200; AFOSR-78-3640)

In order to design survivable aircraft structures accurate vulnerability studies are required. In determining vulnerability of composite aircraft structures to rapid heating threats such as laser weapon systems it is necessary to generate time-temperature profiles in the exposed structure. The object of this effort is to examine the limitations in using the current heat transfer analysis techniques on composite aircraft structures exposed to rapid heating. This effort will identify areas for further work in thermal analysis. This effort will also allow a more realistic appraisal of the structural vulnerability of composite aircraft structures.

A study will be performed to determine limitations in currently available analytical codes. A parametric study will be performed to determine the sensitivity of the analysis results to uncertainties in the thermal material properties and thermal boundary conditions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0021, ADVANCED INERTING TECHNIQUES
C.L. Anderson, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF141850)

It is imperative that the fuel tankage of combat aircraft be protected from fire and explosion that could result in the loss of aircraft. The objective of this program will be to evaluate nitrogen and halon 1301 in preventing fire and explosion in the ullage of aircraft fuel tankage. Ballistically proven inerting systems using nitrogen and halon 1301 have a significant weight savings over internal foam.

Phase I and II testing FY 77 has been completed with questions remaining concerning the effects inertants have on fuel tank sustained fires and the effects of non-worst case conditions on the inertant performance (specifically increased venting). The FY 78 and 79 program will be an extension of Phase I and investigate the effects of increased venting on inertant performance with emphasis placed on halon 1301. Testing will involve the use of a tank wall simulator similar to the Phase I specimen with provisions for venting as a variable. The specimen will be prepared in FY 78 and testing in FY 79.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0022, ELECTRONIC AND DATA SYSTEM DEVELOPMENTS FOR AERODYNAMIC TESTING
D.V. Breitenbecher, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF141560)

The conception and generation of effective weapon systems must first be preceded by extensive operational testing in aerodynamic wind tunnels to achieve optimum design. These facilities include the 50 megawatt RENT and HTL facilities, the TGF and others. The objective of this work unit is to apply unique developments in electronic circuitry and systems to improve performance, reliability and cost-effectiveness of the existing facility data systems as well as those data systems now under development. The application of these techniques to control, monitor, and read facility parameters as well as control the facility will improve the performance, reliability, and cost-effectiveness of the facility.

The facilities will be screened to determine the improvements required and the priority of these improvements. Data systems of existing facilities will be updated via the application of new micro-electronic and computer technologies. The monitoring, reading, and control of critical facilities will be updated by application of the above technologies. Where applicable these techniques will be used as new facilities are planned and developed. New devices for facility diagnostics and control, such as the electron beam, will be designed, tested, and installed to increase data reliability. Modern and more reliable hard wired systems will be developed in-house or purchased, tested and installed where applicable.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0023, MILITARY AIRCRAFT DESIGN METHODOLOGY
J.L. Folck, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF129020)

In support of the laboratory's aircraft design activities, mathematical and computational methods, incorporating man in the loop where appropriate, are needed for the rapid and accurate definition, analysis, design, and evaluation of flight vehicle systems. Vehicle preliminary design analysis will be achieved primarily by collecting and integrating a variety of methods, programs, and computer graphics hardware into a faster, more accurate, and interactive design synthesis computer program. These techniques will be sufficiently developed to analyze a complete flight vehicle design for a specified mission within a few days, rather than several weeks. The ultimate objective is to make high-speed computing power readily and easily accessible to the designer without requiring him to be familiar with the details of programming and computer hardware.

The approach is to develop and acquire the graphics software and hardware required for a designer to communicate with a large design/analysis program (CASP) via a local graphics console to define the vehicle mission and geometry. Existing, more accurate, aerodynamics and mission analysis modules will be modified for inclusion in the CASP program. Methodology for assessing the impact of emerging technologies will be required and incorporated into the CASP program.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0024, SURVIVABLE AIRCRAFT TRANSPARENT ENCLOSURES
R.E. McCarty, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF140230)

This work unit supports the development of USAF aircraft transparent crew enclosures able to survive anticipated operational hazards including bird strike, ballistic threats, aerodynamically induced thermal loads, and exposure to the environment and to routine maintenance procedures. Losses of aircraft and aircrew from transparency impact events remain unacceptably high, transparent materials capable of withstanding the thermal loads imposed by next generation USAF aircraft are unavailable, and reliability and maintainability costs of current transparencies contribute significantly to aircraft life-cycle costs. The objectives of this work unit are the application of a computer program for the design of bird-resistant transparencies, the experimental and analytical assessment of ballistic combat threats upon transparencies, high-temperature criteria development for transparency materials, and failure/cost analyses of current transparencies. The computer program analyses and ballistic assess-

ment studies will improve aircraft/aircrew survivability, the high-temperature criteria studies will increase the operational capabilities of USAF aircraft, and the failure/cost studies will reduce the life cycle cost of flight vehicle transparency subsystems.

A previously developed computer program will be utilized to do correlation studies of B-1 windshield bird strike. Existing bird strike test data will be utilized and a technical report will document the correlation obtained between data and computed results. The failure/cost work will analyze results of a contracted study and formulate plans to apply the results. The ballistic threat work will determine transparency response to operational ballistic threats and report the results. The high-temperature criteria work will interface with a contracted program planned for a FY78 start.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0025, MILITARY FLYING QUALITIES RESEARCH

D.J. Moorhouse, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF132100)

This work unit supports TPO 3, Flight Control, and specific goal FG02a, Flying Qualities and Development Criteria. The mission effectiveness of all classes of military airplanes is heavily influenced by the flying qualities of the vehicle. The effects of flying qualities can range from minor nuisance to flight safety in nature. The objective of this effort is to plan and coordinate research programs to investigate new approaches to design criteria and to establish flying qualities requirements which will insure adequate airplane characteristics for the mission needs. The results of this effort will ultimately be incorporated into military specifications MIL-F-8785, 'Flying Qualities of Piloted Airplanes,' MIL-F-83300, 'Flying Qualities of Piloted V/STOL Aircraft,' and possible future specifications for remotely piloted vehicles.

This effort will consist of reviewing existing flying qualities requirements. Joint programs will be initiated with other government agencies employing fixed base and in-flight simulation capability. New concepts in control system analysis and handling qualities specifications will be examined.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0026, DYNAMICS ENVIRONMENT ON CURRENT AND FUTURE AF FLIGHT VEHICLES

D.E. Seely, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF138010)

To define the dynamics environment existing on current and future AF flight vehicles during flight and ground operation. There is little or no angular vibration data available and insufficient linear vibration and acoustic data available on 'state-of-the-art' flight vehicles to guide design engineers as to the environment that the airframe, electronic, and electrooptical systems will be subjected to. The objective of this work unit will be to measure and record the angular and linear vibration and noise throughout the airframe to determine the magnitude and source of vibration and acoustic energy generated in the aircraft. The data obtained will be used to (1) solve operational problems, (2) update military standards and test specifications, (3) improve system reliability, (4) improve combat effectiveness, and (5) enhance flight safety.

A request 'PID' for an F-111 testbed aircraft has been submitted to ADTC/TGPM on 26 May 76. Another request 'PID' is being submitted to Edwards AFB Flight Test Center for an F-15 testbed aircraft. FBG has an instrumented RF-4C testbed aircraft at ADTC. When the F-111 and F-15 are available, they will be instrumented with suitable accelerometers and microphones, signal conditioning equipment and magnetic tape recorders. Flight tests will be performed at Eglin AFB and at Edwards AFB.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0027, RESEARCH IN PROPULSION

C.L. Walker, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Air Mobility Research & Development Lab., *21000 Brookpark Rd., Cleveland, Ohio* 44135 (DA0E3533)

In joint participation with NASA-Lewis Research Center, conduct a fundamental and exploratory program of basic research to provide a technological base in the general areas of small turbine engines and helicopter drive-train systems. Topics also include advanced materials as well as a design and analysis techniques.

Specific areas of study are selected on the basis of a continual review of the Army's aviation objective and assessment of those fundamental technological deficiencies which prevent or impede achievement of the objectives. The technology base is continually expanded through research effort for engine and drive-train components, including materials, processes and heat tranfer. Consideration is also given fgr understanding ways to adopt technology from larger engines to use in small sizes applicable to Army aviation.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Air Mobility Research & Development Lab.

1.0028, CANOPY GLINT SCREENING INVESTIGATION - ARMY HELICOPTERS

S. Blewitt, Boeing Co., Vertol Division, *P.O. Box 16858, Philadelphia, Pennsylvania* 19142 (DA0D4071; DAAJ02-76-C-0061)

Investigate helicopter canopy concepts that have the potential of eliminating/reducing the sun glint signature and internal reflections associated with current designs.

Identification and screening of promising concepts for both attack and observation helicopter applications and the fabrication, test, and evaluation of those concepts that analyses indicate are capable of satisfying the requirement.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0029, ADVANCED CARGO RESTRAINT SYSTEM INVESTIGATION FOR COD AIRCRAFT

J. Shefrin, Boeing Co., *P.O. Box 16858, Philadelphia, Pennsylvania* 19142 (DN881349; N62269-77-C-0342)

This investigation is intended to produce a concept specification for an advanced cargo restraint system. The primary objectives of such an advanced system shall be: reduction in restraint equipment weight; reduction in time required for cargo handling, tiedown and release; minimum stowage volume; and low cost. Energy management techniques shall also be applied to the cargo restraint system to enhance survivability of passengers and crew under crash conditions. The selected system shall be acceptable to current Navy COD (carrier on board delivery) as well as future Navy aircraft with COD or VOD (vertical on board delivery) capabilities. This contract supports work unit ZA601, DN681080.

This effort requires correlation of cod aircraft (C 2A) operational requirements, cargo configurations, aircraft tiedown geometry, energy management concepts, tension device materials technology, aircraft crash dynamics, and existing Navy static crash load criteria. Trade-off investigations will be conducted leading to a recommended restraint system concept specification.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0030, A STUDY OF LANDING GEAR DYNAMICS

H.M. Fishman, Franklin Inst. of the State of Pennsylvania, *20th & Benjamin Franklin Pkwy., Philadelphia, Pennsylvania* 19103 (DN881493; N62269-78-C-0016)

To develop and demonstrate a second generation landing gear analysis system. This contract supports work unit ZA601, Aircraft Technology, Agency Accession No. DN 6801080.

Needed advances will be identified through survey of industry methodology and practice procedures will be devloped to meet these needs.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0031, VALIDATION OF AEROELASTIC TAILORING BY STATIC AEROELASTIC AND FLUTTER TESTS
A.E. Allis, General Dynamics Corp., *P.O. Box 748, Fort Worth, Texas* 76101 (DF138210; F33615-77-C-3105)

This work supports the functional area of aircraft aeroelastic design involving flight safety and improved aerodynamic performance. Aeroelastic tailoring of composites offers the potential of designing aircraft lifting surfaces to be free from aeroelastic instabilities, provide the required strength margins and improve certain aerodynamic qualities such as improved lift or reduced drag. The work unit will address the validation and quantification of the benefits obtainable through aeroelastic tailoring. The specific objective of this work is to experimentally verify that aeroelastic tailoring of filamentary composite structures for Air Force aircraft will enhance performance and provide a life-cycle cost savings. Preliminary analysis results indicate ten percent improvement in turn rate and range can be achieved for a lightweight fighter design and a 15 percent range improvement is possible for a bomber design when aeroelastic tailoring is incorporated. In order to be a usable design concept, an aeroelastically tailored design must also be compatible with cost-effective manufacturing concepts, retain the tailored stiffness and strength throughout the service life of the aircraft, and demonstrate the performance gains.

To adequately demonstrate the capability to meet the above stated objectives, scaled models of a representative configuration will be tested to measure aerodynamic performance and deflections under actual airloads and to determine flutter characteristics in a wind tunnel. The tailored stiffness properties of the full scale design will be scaled in the static aeroelastic model for transonic testing. Stiffness and mass will be scaled in the flutter model. The models will be fabricated in composite materials to duplicate the anisotropic properties. Prior to wind tunnel testing, static load deflection and proof tests will be conducted.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0032, AIDS AIRCRAFT INTEGRATION (A-7)
P. Greer, Vought Corp., Vought Aeronautics, *P.O. Box 5907, Dallas, Texas* 75222 (DN881141; N62269-77-C-0186)

To provide inputs to aid in the development of the AIDS (Advanced Integrated Display System). The AIDS program objective is to develop a totally new concept in modular cockpit instrumentation for naval air missions under all operational conditions, accommodating all aircraft sensors, and satisfying 1980 era requirements for dependability and supportability. This contract supports work unit ZA601, Agency Accession No. DN681080.

The contractor will examine the aids concepts in relation to a particular existing aircraft (A-7E) manufactured by Vought and project this evaluation to a future tactical aircraft such as is envisioned by Vought.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0033, ADVANCED TRANSMISSION WEIGHT PREDICTION TECHNIQUES
R.S. StJohn, Vought Corp., *P.O. Box 5907, Dallas, Texas* 75222 (DN889787; N00140-77-C-1425)

To develop weight prediction/estimation methodology for mechanical power transmission components with particular emphasis in the high-speed/high-power ranges projected for V/STOL Type A aircraft.

Conduct a study and analytical program resulting in a descriptive manual on the methods and techniques derived for the calculation of weight of mechanical power transfer components. The manual includes a computer program which estimates the size/weight of system components based on design criteria and is analytically responsive to: gear ratio, diametral pitch, allowable stress, pitchline velocity, power transfer, dynamics and/or installation factors, and new technology. The program develops the weight estimation methodology for drive system components in the following tasks: (a) gears and transmissions; (b) clutches; (c) shafts; (d) bearings and couplings; (e) associated system supports; (f) final report; (g) computer program and users manual.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

1.0034, HT ST 78-32 - DRAFT HELICOPTER STRUCTURAL (HSIP) CRITERIA
A.J. Gustafson, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0E3817)

The objective of this work is to draft a preliminary military specifications to govern the structural integrity of Army helicopters.

MIL STD 1530 Aircraft Structural Integrity Program, airplane requirements, which was developed by the Air Force for fixed-wing aircraft is an excellent approach to structural integrity. This specification will be converted to apply to helicopters and to include composite materials. Major differences in the types of loads, steady and alternating, operating environment and operation usage between fixed-wing and helicopters, necessitate changes to MIL STD 1530. Supporting specifications such as MIL STD 8698, and specifications for landing gear also have to be modified to meet the structural integrity concept and to bring these specification up-to-date.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0035, HT PP 78-31 - MINI-RPV PROPULSION SYSTEM TESTS AND EVALUATION
Unknown, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0E3831)

This house task has two major objectives for FY78: (1) government evaluation of the two 20 HP mini-RPV demonstrator engines to determine their limitations and capabilities through component/system tests and (2) to define an integrated propulsion system for future RPV aircraft.

Conduct performance (dynamometer) and endurance (propeller) testing of the two 20 HP mini-RPV demonstrator engines currently under contract. Test individual components/systems (engine/alternators, propeller, fuels, oils) to define their limitations and test complete propulsion packages. Obtain potential propulsion system components/systems and run tests to evaluate performance and durability to assist in defining an integrated propulsion package. Define cooling requirements and configurations for a total integrated RPV propulsion package through experimental integration of previously developed components.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, IN (X) GA (1-X) AS (Y) P (1-Y) MATERIALS RESEARCH FOR INFRARED DETECTOR APPLICATION
A.R. Clawson, U.S. Dept. of Defense, Navy, Naval Ocean Systems Center, Electronics Engineering & Sciences Dept., *San Diego, California* 92152 (DN587579)

To investigate the preparation and properties of the quaternary semiconductor alloy indium (x) gallium (1-x) arsenide (y) phosphide (1-y) for infrared applications in the 1.0 to 1.3 microns wavelength region. To study p-n junction structure for their properties suitable to be used for electrooptical detectors for Navy fiber optics communications systems.

This work is closely coordinated with research and development on optical fiber communications and is intended to provide materials for detectors for such applications. It is concerned with growth and characterization of indium (x) gallium (1-x) arsenide (y) phosphide (1-x) by liquid phase epitaxy lattice matched to indium phosphide substrates to minimize detrimental crystallographic strain & defects and with appropriate doping to form p-n junction detectors. Adjustment of the alloy composition will provide both the lattice match and the appropriate bandgap for response at a specific wavelength between 0.92 and 1.66 microns.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0002, DEVELOPMENT OF DIRECTIONALLY SOLIDIFIED EUTECTIC NICKEL ALLOYS
F. Lemkey, United Technologies Corp., Research Laboratories, *400 Main St., East Hartford, Connecticut* 06108 (DN890060; N62269-77-C-0055)

To develop the ductile matrix/ductile fiber eutectic gamma prime/gamma plus alpha nickel base alloy for turbine blading operable at 1850 F and above.

Elements are being added to the system based on Ni-31% Mo-6.2% Al, including Cr, Co, Fe, Ta, W, Re, Ti and C. Strength, ductility, oxidation-sulfidation resistance, thermal fatigue, and creep are being evaluated.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0003, BASIC CHEMICAL AND PHYSICAL PROPERTY EVALUATION, HAZARD ANALYSIS & HANDLING OF SYNTHETIC AND PETROLEUM DERIVED JP-5 FUEL
R.N. Hazlett, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN580087)

To determine the basic chemical, physical and flammability properties of jet fuels derived from oil shale, tar sands, coal and heavier petroleum crudes. To define composition/property relationships of fuels and to examine ways to modify unsatisfactory properties by compositional change. To determine the effectiveness of standard fire fighting techniques with synthetic fuel and to develop additional methods and procedures as needed.

NRL is performing a comprehensive chemical, physical and flammability program to evaluate the characteristics of jet fuels. The NRL work will emphasize non-specification tests, composition/property relationships, and chemical analyses. Fire suppression techniques for substitute JP-5 will be evaluated in tests up to volumes of 300 gallons of fuel.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

3.0004, PETROLEUM JET FUEL THERMAL STABILITY
R.N. Hazlett, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN639147)

To give a chemical rationale to the complex oxidative and pyrolytic degradation reactions of jet aircraft fuels which give undesirable products such as varnishes and gums in fuel system components. Developments arising from these efforts will aid in defining jet fuel composition and suggesting alternate fuel-handling procedures and materials for fuel system components.

The chemical reactions of jet aircraft fuels and hydrocarbon components are being studied in a flowing system which simulates the heat stress in an advanced aircraft fuel system. The main effort is for exposures associated with short times, high temperatures (500-1000 degrees F), and air saturated fuels. The overall chemical reaction schemes are being examined so that the critical oxidative and pyrolytic reactions can be identified and altered. The elemental composition of deposits formed in various devices is also being utilized to define the important fuel reactions.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

3.0005, NAVY VEHICLE & MATERIAL SUPPORT TECHNOLOGY - MECHANISMS OF CRACKING IN HIGH-STRENGTH ALLOYS
D.A. Meyn, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN220026)

Cracking mechanisms, resultant from presence of trace elements, of alloys which are either in-service or are candidates for in-service aircraft weapons systems are studied via electron fractography in order to better understand these mechanisms and alleviate the problems.

Crack initiation and fracture processes are dependent upon the stress, trace elements, and microstructures local to the crack tip. Titanium, steel, and aluminum alloys are studied in both laboratory specimens and in service-failed components in order to both carefully control crack tip conditions and to compare these laboratory studies to those from the specialized laboratory of service conditions.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Systems Command, Engineering Div.

3.0006, FUEL TESTING OF ANTIMISTING KEROSENE (JET A) WITH FM-9 ADDITIVES
Unknown, U.S. Dept. of Defense, Air Force, *Robins Air Force Base, Warner Robins, Georgia* 31098 (FA78WAI-925; FA161468 (TRAIS NO.))

Warner Robins AFB is contracted by FAA and US Air Force to furnish the procurement support required for conducting antimisting kerosene (AMK) with FM-9 additive, fuel system compatibility testing utilizing the government's C-141 fuel system simulator. FM-9 is a product designation of the Imperial Chemical Industries, LTD., and is to be evaluated as fuel that would preclude the fireball when large quantities of fuel are released from ruptured tanks. There will be an improved occupant survivability in impact survivable accidents.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

3.0007, CHARACTERIZATION OF MECHANICAL, THERMAL AND WEAR PROPERTIES OF TI-RICH METALLIC GLASSES 15098-MS
B.C. Giessen, Northeastern University, School of Liberal Arts, Dept. of Chemistry, *360 Huntington Ave., Boston, Massachusetts* 02115 (DA0F9251; DAAG29-78-G-0137)

To study the mechanical and thermal properties of ternary and quarternary amorphous alloys with compositions involving between 50 and 80 atomic percent of titanium. Relevance - the research has potential application to a wide variety of bearing and faying surfaces, where wear, galling, fretting, and corrosion have been problems in the past in helicopter hardness and a wide range of components of ground vehicles. Hard facings for drilling and construction machinery are other possible applications.

The research is to include the following: samples are to be produced by rapid liquid quenching of the corresponding liquid; x-ray diffraction and differential scanning calorimetry will be used to characterize the materials in the quenched state and after various stages of annealing. Mechanical properties, including bulk, shear, and Young's moduli, hardness, tensile, and wear behavior will be measured for the various structures and compositions produced.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0008, TIME-TEMPERATURE STUDIES OF HIGH-TEMPERATURE DETERIORATION PHENOMENA IN LUBRICANT SYSTEMS - SYNTHETIC ESTER LUBRICANTS
L.R. Mahoney, Ford Motor Co., *The American Rd., Dearborn, Michigan* 48121 (DF043810; F44620-76-C-0097)

AF function - propulsion systems for advanced aerospace vehicles require improved lubricants which will withstand a wider range of temperature conditions, greater contact loads and higher shear rates. Deficiency - synthetic lubricants continue to fail at

elevated temperatures due to complex chemical and physical interactions of the lubricant with its environment and with metal surfaces. Objective -investigate deterioration and metal corrosion phenomena occuring in lubricant systems in oxidative environments at high temperatures. How work contributes - research data will be used to improve lubricants for AF application.

Utilizing stirred flow reactor techniques a study will be conducted to determine (1) the kinetics and mechanisms of the oxidative and thermal reactions of a synthetic ester lubricant, with and without antioxidants at temperatures from 180-220 degrees centigrade at various reaction times (2) the rates of metal corrosion phenomena and the influence of corrosion products on the course of oxidative and thermal reactions of the synthetic ester over the same temperature ranges (3) the effects of oxidation products on the wear behavior of the ester lubricant.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0009, SERVICE EVALUATION OF GRAPHITE COMPOSITES IN CONTACT WITH METALS ON F-4

R. Britton, McDonnell Douglas Corp., *P.O. Box 516, St. Louis, Missouri* 63166 (DN781219; N62269-76-C-0280)

To obtain environmental data under Navy operational usage for (1) verifying the effectiveness of current design and material selection criteria, (2) verifying corrosion prevention methods used in graphite/epoxy-metal combinations, (3) determining amount and rate of water absorption and its effect on mechanical properties of graphite/epoxy composites on naval aircraft. This contract is in support of work unit ZA101, 'Aircraft Technology', Agency Accession No. DN 681080.

Four sets of access doors (1 vertical and 1 horizontal per set) will be fabricated with test specimens attached, including graphite laminates, simulated mechanical fastened joints, adhesive bonded joints, and sandwich elements. The access doors will be installed on 4 carrier-based F-4 aircraft (one set each) and during an exposure period of 2 years, the test access doors will be inspected and test specimens removed periodically for moisture absorption analysis. At the end of 2 yr. exposure, the access doors will be returned to NavAirDevCen for further nondestructive and destructive evaluation.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

3.0010, RADIATION AUGMENTED COMBUSTION

A.E. Cerkanowitz, Exxon Research & Engineering Co., Government Research Laboratory, *1600 Linden Ave., Linden, New Jersey* 07036 (DF048730; F49620-77-C-0085)

AF function - advanced air-breathing engines, airborne reconnaissance and transport, weapon delivery and defense. Deficiency -present aircraft operation limited by combustion associated phenomena such as flammability, flame propagation, ignition and stable combustion. Insufficient understanding available of basic mechanisms and processes associated with promising techniques for enhancement of combustion and combustion initiation and for evaluation of feasibility of concept for extending operability range and stability. Objective - to investigate and evaluate the feasibility of various techniques in extended current aircraft operational limitations due to combustion associated phenomena with emphasis on photochemical techniques. To formulate realistic mathematical models describing the ignition, combustion and stability enhancement phenomena. How work contributes - will provide additional understanding and modeling of processes associated with ignition, combustion and stability enhancement, will aid in evaluating the potentials of various techniques, including photochemical energy addition, for providing efficient means of extending aircraft operational range beyond the continuous flight corridor presently dictated by normal (spark) ignition.

This program encompasses investigation and feasibility evaluation of promising techniques for extending aircraft operational limitations due to combustion associated phenomena. Emphasis will be on study of photochemical radiative augmentation techniques to enhance combustion, initiation, reaction kinetics and propagation rate. Particular attention will be given to combustion aspects which represent limiting conditions on combustor operation such as flammability limits, flame propagation, ignition and stability limits. Other approaches such as use of laser irradiation, modified spark and plasma-torch will also be considered. Suitable vacuum ultraviolet and ultraviolet sources have been acquired and will be fully characterized using spectroscopic and combustion diagnostic techniques. Additional tests will delineate photon-reactant mixture interactions. Characterization of enhanced ignition and combustion by photochemical and other techniques at aircraft combustor and afterburner conditions will be explored in a flow combustor both in a simple premixed mode and in a cannular combustion mode using gaseous and liquid fuels. Consistent experimental and theoretical descriptions of the ignition and combustion enhancement phenomena will be developed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0011, THERMODYNAMIC AND DIELECTRIC PROPERTIES OF POLAR FLUIDS

J. Lebowitz, Rutgers the State University of New Jersey, New Brunswick Campus, Graduate School, *Old Queens Bldg., New Brunswick, New Jersey* 08903 (CHE78-08730)

This project is in the Structural Chemistry and Thermodynamics program, in the subarea of liquid state theory. Dr. Lebowitz and Dr. Wertheim will study the dielectric and thermodynamic properties of dense systems of polar molecules by theoretical methods. The methods to be used are graphical techniques and thermodynamic perturbation theory. Some effort will also be devoted to development of formal theory and rigorous results. The research will be directed towards understanding the behavior of models of polarizable polar molecules, which are closer approximations to real molecules than the non-polarizable models mostly studied so far. Results will be compared with computer simulation, carried out elsewhere, and experiment, where appropriate.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

3.0012, FUNDAMENTAL STUDIES OF THE STRUCTURE AND CHEMISTRY OF SOLID SURFACES

R.P. Merrill, Cornell University, Ithaca Campus, School of Engineering, Dept. of Chemical Engineering, *242 Carpenter Hall, Ithaca, New York* 14853 (DF049610; F49620-77-C-0118)

AF function - propulsion and power generation systems for future AF weapon systems may depend upon synthetic fuels and surface-induced combustion. Heterogeneous catalysis is an essential element for the synthesis of fuels and for the decomposition of propellants used to generate power and/or thrust. Deficiency - physical degradation of catalyst particles in monopropellant thrustors has become a limiting factor in engine life. Objective - this research has two major objectives. One is directed toward the theoretical and experimental studies of oxidation and hydrazine decompositions occurring on noble metal surfaces such as iridium. An equally important and collateral objective is to understand how oxide layers on aluminum and titanium surfaces withstand corrosive attack. How work contributes - hopefully better catalysts with longer lifetimes can be developed if enough is known about the basic surface chemistry of the catalytic process. Also improved inhibitor systems can be found to protect components and aircraft structural metal surfaces from corrosion damage.

An elaborate ultra-high vacuum scattering chamber will be used to make precise measurements of surface composition and structure, both atomic and electronic. The apparatus is sufficiently versatile to permit analysis by electron spectroscopy, LEED intensity measurements and both elastic helium scattering and reactive surface scattering techniques. Specific studies will be made of oxide layers on titanium and aluminum surfaces, the decomposition of hydrazine on iridium catalyst and selected oxidation reactions on platinum.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0013, ELASTIC-PLASTIC DEFORMATION IN CRACKED SOLIDS AND DUCTILE CRITERION 15226-E

H.W. Liu, Syracuse University, L.C. Smith College of Engineering, Dept. of Chemical Engin & Metallurgy, *Link Hall, Syracuse, New York* 13210 (DA0F9176; DAAG29-78-G-0069)

To develop a ductile fracture criterion and a rational testing procedure for fracture toughness measurements. Relevance - this research is important in the analysis and design of Army structures and materiel particularly since lightweight, ductile and tough materials are needed for helicopter and lightweight armor.

An experimental and numerical analysis on crack tip deformation and crack tip stresses will be carried out on bending and tension specimens.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0014, MICROSTRUCTURAL PROCESSES IN THE DEFORMATION AND FRACTURE OF POLYMERS 13566-MS

J.C. Li, University of Rochester, School of Engineering & Applied Science, Dept. of Aerospace & Mechanical Science, *260 Crittenden Blvd., Rochester, New York* 14627 (DA0E9205; DAAG29-78-G-0159)

To study microstructural mechanisms involved in the deformation and fracture of polymeric materials. Relevance - a wide variety of Army materiel, such as fuze components, aircraft canopies, canteens, and personnel armor are comprised of polymeric materials which have exhibited premature unpredicted failures. The proposed research addresses subjects that will hopefully assist in explaining and circumventing such failures.

Study micromechanisms of deformation and fracture in metals and ceramics, including defect analysis, thermally activated deformation, and electron microscopy. Aspects of slip, including morphological details, and activation parameters for slip and craze formation would be studied. Finally, study mechanisms whereby additives and processing methods strengthen and toughen glassy polymers.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0015, ROLLING FORMING JOINING TITANIUM ALUMINIDE SHEET

A. Hoffmanner, Battelle Memorial Inst., *505 King Ave., Columbus, Ohio* 43201 (DF680840; F33615-75-C-1168)

The objective of this program is to establish fabrication procedures and resulting properties for titanium aluminide base alloys rolled to sheets of varying thickness, formed into complex shapes, and joined together into scaled component assemblies typical of those used in aircraft turbine engines.

This program shall consist of three phases to be accomplished simultaneously. Phase A shall be a further investigation into sheet rolling techniques leading to thinner, wider, sheet than is now available. Phase B will be an exploratory study of sheet forming by several methods. Phase C is an exploratory investigation of joining sheet materials by welding, and diffusion bonding.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Materials Lab.

3.0016, COMPOSITE MATERIALS FOR TACTICAL SHELTERS

A.M. Strauss, University of Cincinnati, School of Engineering, Dept. of Engineering Analysis, *101 Baldwin Hall, Cincinnati, Ohio* 45221 (DF052170; AFOSR-78-3588)

AF function - extension of new technology to aircraft protective shelters will improve the operational readiness of the AF. Opportunity -rapid progress is being achieved in applying advanced composites to aerospace vehicles which can be extended to other AF structures of interest. Objective - to understand the structural improvements which can be made in tactical shelters by using advanced composite materials. How work contributes - research results contribute to development programs at CE laboratories.

Research will apply methods of stress analysis, blast loading analysis and penetration mechanics to tactical shelters composed of kevlar. Basic methods now used in shelter design handbooks will be examined to evaluate their suitability for kevlar materials. In addition, the further evaluation of kevlar as an improved shelter material will be continued in a manner which follows the positive findings of the investigator while in residence at Tyndall Air Force Base.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0017, COUPLED DIFFUSION IN COMPOSITES

G.C. Sih, Lehigh University, Inst. for Fracture & Solid Mechanics, *Alumni Memorial Bldg., Bethlehem, Pennsylvania* 18015 (DF047520; F49620-77-C-0054)

AF function - advanced aerospace vehicles will require improved performance and durability in the future. Deficiency - there is a lack of knowledge related to the behavior of advanced composites when exposed to high humidity and elevated temperature. Objective - objective of this research program is to develop a mathematical model of the response of composites to hygrothermal coupling. How work contributes - this research contributes to the Air Force R&D effort to utilize advanced composites on aerospace vehicles.

Analysis techniques will be developed to consider the combined effects of moisture absorption and elevated temperature on composites. The analysis of these two effects will consider coupled behavior. Plate structures will be used in the analysis and utilize symmetric and unsymmetric surface exposure. In addition, sudden surface temperature changes will be considered and its influence on the spatial distribution of stress, strain, heat and concentration studied.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0018, FORMAL AND COMPUTATIONAL STUDIES IN THE QUANTUM THEORY OF MOLECULAR DYNAMICS

D.J. Kouri, University of Houston, School of Arts & Sciences, Dept. of Chemistry, *3801 Cullen Blvd., Houston, Texas* 77004 (CHE7618970A02)

Both inelastic and reactive molecular collisions will be studied. Studies of inelastic scattering processes will continue using rotating frame approaches, especially the new statistical-jz conserving approximation. Special attention will be given to the physical bases of the approximation, extensions to new systems, treatment of differential cross sections and molecule-molecule systems, and predictions of transitions. Studies of collisions involving H2 plus H2, H2 plus HCl, Li ion plus H2 and Ar plus CO2 will be made using the original jz method.

In the study of reactive scattering, the new approximate optical potential of Lin and Kouri will be applied to K plus CH3I, KI plus CH3, and the F plus H2 reactions. The new K-operator formalism will be applied to a simple model for breakup.

This work is a continuation of that currently supported by Foundation Grant, MPS-7413719.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

3.0019, ACCURATE METHODS IN QUANTUM MECHANICS

F.A. Weinhold, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Chemistry, *500 Lincoln Dr., Madison, Wisconsin* 53706 (CHE7622760A02)

Weinhold plans to extend the development and application of procedures for determining rigorous error limits in quantum-mechanical calculations of the electronic properties of atoms and molecules. Such error bounds permit sharpened comparisons of theory with experiment while also providing internal criteria for the reliability of theoretical predictions when experimental comparisons are unavailable. Initial work will include a series of high-accuracy applications of these methods to two-electron atoms and ions. At the same time, development will proceed on a new set of high-accuracy computer programs for two-electron

diatomic molecules. Such programs will permit broad extension of errorebound methods into the molecular domain, where the characteristic anisotropies and vibrational dependence of electronic properties present many interesting unsolved problems. Work on several new methods for treating continuum properties (especially photoionization cross sections) by bound-state techniques, incorporating special basis functions which can insure the proper high-energy features of the variational spectrum will be continued. In addition, a theoretical investigation of optical activity will be continued, seeking particularly to analyze recent empirical 'rules' for chiroptical behavior of substituted ketones on the basis of a simple Huckel-like molecular orbital model for delocalized networks. This work is a continuation of that supported by Foundation grant GP-16112 at Stanford University.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

3.0020, THE EFFECT OF CHLORIDE ON THE HIGH-TEMPERATURE LIQUID PHASE CORROSION OF METALS AND CERAMICS

W.W. Liang, University of Wisconsin, Milwaukee Campus, School of Engineering & Applied Science, *Pearse Hall, Room 107, Milwaukee, Wisconsin* 53201 (DMR7826344)

The problem of accelerated corrosion of high-temperature materials such as superalloys and ceramics (e.g. silicon carbide and silicon nitride) used as components in fossil-fuel energy producing systems can place serious limitations on the life span and operating efficiency of these systems. The protective qualities of the adherent oxide scales or oxide coatings of these high-temperature materials are destroyed by the liquid salt deposits from the hot combustion gases. Sodium sulfate is found to be the major constituent in the deposits in gas turbines. However, the presence of sodium chloride in the deposits is conceivably due to the short residence time which occurs in gas turbine combustion chambers. In power-generating systems utilizing gasified coal, the likelihood of the presence of chloride in the salt deposits is increased. Therefore, a small amount of chloride present in the liquid surface deposits may be critical to the hot corrosion process. The principal purpose of this program is to determine the role of chloride present in the liquid sulfate deposits which attack the protective oxides (i.e., alumina, chromia, silica, etc.) on ceramic and metallic materials at high temperatures.

In this study, the 'Acid-Base Hypothesis' will be tested by measuring the activity of sodium oxide in liquid sodium chloride-sulfate mixture as a function of temperature, chlorine potential, sulfur potential and oxygen potential. To understand the mechanism of sodium sulfate-induced hot corrosion, the kinetic properties of the reactions between the protective oxides and liquid sulfate deposits will also be determined. This is a continuation of research that began at the U. of Illinois under DMR77-06480.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

3.0021, ENVIRONMENTAL BEHAVIOR OF POLYMER MATRIX COMPOSITE MATERIALS 13323-MSX

D.F. Adams, University of Wyoming, School of Engineering, Dept. of Mechanical Engineering, *P.O. Box 3435, University Station, Laramie, Wyoming* 82070 (DA0E9027; DAAG29-78-G-0053)

To quantitatively characterize the degradation of the mechanical properties of polymer matrix composites which occurs with exposure to moisture and thermal cycles. The research is relevant to the environmental deterioration of epoxy matrix composites which are used in Army aircraft, missiles, and packaging for shipping of materiel. The deterioration of mechanical properties of these materials with long-term exposure to moisture and thermal cycles is very important to the storage life of Army missiles, rocket launchers, and aircraft. This deterioration is reportedly the number one materials problem for Army aircraft.

The program will include analytical investigation of the mechanisms responsible for environmental degradation, including the development of a finite element computer program to model the mechanisms, and experimental evaluation of the effects of environment on the mechanical behavior, thermal expansion coefficient, and moisture dilatation of epoxy and of graphite- and glass fiber-reinforced epoxy matrix composites.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, MANUFACTURE OF LITTLEJOHN SPIN ROCKET MOTORS

G. Webb, Thiokol Corp., *Huntsville, Alabama* 35807 (DA0G1039; DAAK40 76 C 0170 MOD 9)

Manufacture 15, TX-76 Littlejohn spin rocket motors, assemblies and igniters and deliver to Propulsion Directorate, Redstone Arsenal, Alabama.

SUPPORTED BY U.S. Dept. of Defense, Army, Missile Research & Development Command

4.0002, MODIFICATION OF M-72 IGNITION SYSTEM (GROWLAR)

J.C. Hodges, U.S. Dept. of Defense, Army, Missile Research & Development Command, Propulsion Directorate, *Redstone Arsenal, Huntsville, Alabama* 35809 (DA0G1040)

Modify 50, M-72 rocket motors ignition systems from percussion to electric.

Design, manufacture and test electrical ignition systems for the M-72 rocket motor.

SUPPORTED BY U.S. Dept. of Defense, Army, Missile Research & Development Command

4.0003, ANALYSIS OF STEADY AND UNSTEADY TRANSONIC FLOWS

A.R. Seebass, University of Arizona, School of Engineering, Dept. of Aerospace & Mech Engin, *Tucson, Arizona* 85721 (DF042730; AFOSR-76-2954)

AF function - advanced aerospace vehicles. Deficiency - lack of basic knowledge on how to calculate forces and moments on two-dimensional and three-dimensional configurations for both steady and unsteady flows that may, or may not, have boundaries simulating tunnel walls. Objective - develop a rapid and efficient method of calculation for steady and unsteady transonic flows. Analyze steady and unsteady small perturbation transonic flows with emphasis in the area of wind-tunnel testing problems. How contributes - a better understanding of steady and unsteady transonic flows will enable us to include calculations of this type in the design process. It will also enable us to modify such designs on the basis of wind-tunnel measurements.

Specialized computational procedures appropriate to steady and unsteady transonic flows will be further developed and extended to new cases. Topics will include unsteady flow over airfoils, correct accounting for shock motion, extension of shock fitting methods to non-normal shocks, behavior of an expansion-corner flow, flows over swept wings, use of finite elements to calculate mixed flows, and impingement of shock waves on ventilated wind-tunnel walls.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0004, NONLINEAR INTERACTIONS IN SUPERFLUID DYNAMICS - SUPERCRITICAL COUNTERFLOW AND SHOCKWAVES

H.W. Liepmann, California Inst. of Technology, School of Engineering, Dept. of Engineering & Applied Science, *1201 E. California Blvd., Pasadena, California* 91109 (DF040450; F44620-75-C-0038)

AF function - the proposed research primarily falls in the 4.2 and 5.3 ROs which deal with the determination of the air flow

characteristics associated with aircraft and missiles and the generation of usable electric power from non-nuclear energy sources. In particular research into the development of turbulent boundary layer and heat transfer in liquid helium to keep the superconductor generator cool is a basic air function. Deficiency - the majority of practical flight conditions occur at velocities and altitudes for which the boundary layer is turbulent, however, accurate and analytical techniques exist only for the laminar case. Research is required on the fundamental process of turbulence. The development of superconductive rotating electrical power generators and pulsed superconductive energy storage systems required the ability to keep the system cool. The investigations into heat transport of liquid helium is of prime importance. Objective -the objective of the research is to continue the investigation of HeII turbulence in particular to investigate the motion of thermal shock waves and corresponding nonstationary heat transfer. Contribution -this research is a part of a comprehensive program in superfluids and superconductors.

The critical velocities in HeII and the onset of turbulence are of primary interest in the proposed investigation, and are based upon previous experience and results. It is proposed to study the critical heat flux in HeII by experiments with finite amplitude second sound waves, i.e., thermal shock waves. The velocity in the wake of a second sound shock is uniquely related, through the two-fluid equations, to the speed of the shock. Consequently, thermal shock waves in HeII can be used like ordinary pressure shocks in gases to explore the variables of state. The application of thermal shock wave studies to the exploration of the critical velocities supplements steady-state experiments of heat transfer in two ways. The transition induced by a thermal shock occurs in the absence of solid boundaries, and hence, vortex nucleation problems on solid walls are absent. Second, the rise-time in temperature in a thermal shock is fast and permits the investigation of finite relaxation times in the breakdown of the superfluid state.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0005, RPV (REMOTELY PILOTED VEHICLES) AIR LAUNCHED PROJECTILE CEP AND ANALYSIS

G. Harris, Developmental Sciences Inc., *15747 E. Valley Blvd., P.O. Box 1264, City of Industry, California* 91749 (DA0E3846; DAAK51 78 C 0008)

To demonstrate by conceptual hardward the feasibility and accuracy of RPV air launched projectiles (2.75-inch rockets).

Design and build an RPV capable of launching 2.75-inch and Viper rockets using airborne video data and operator control. After testing, assess techniques and accuracy.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

4.0006, RADAR TRAINING FACILITY

Unknown, Logicon Inc., *21535 Hawthorne Blvd., Torrance, California* 90503 (FA78WA-4101; FA161205 (TRAIS NO.))

The contractor shall design, develop, construct, integrate, test, install and support Radar Training Facility (RTF) for use in the training of Air Traffic Controllers. The RTF is to be installed at the FAA Academy at Oklahoma City in FAA provided space.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

4.0007, CRYOGENIC HE3 NUCLEAR GYRO

D.B. Debra, Stanford University, School of Engineering, Dept. of Aeronautics & Astronautics, *Stanford, California* 94305 (DF052880; F49620-78-C-0088)

AF function - self-contained high-precision navigation systems are of prime military importance in air and space flight and weapons systems. Opportunity - results in atomic physics and cryogenic technology suggest the use of particle spins as gyroscopic reference with a potential for very high accuracy guidance systems realizations at reduced costs. Objective - demonstrate the feasibility and the limitations of a cryogenic nuclear magnetic resonance gyroscope as precision angle and angular rate reference, followed by an assessment of the potential of its combination with a cryogenic gravity-gradiometer. How work contributes - will lead to a new guidance system which employs local vertical tracking and complements or improves conventional inertial guidance systems.

Polarized He3 nuclei, cooled to 4.2 K will be caused to precess at right angles to a small constant magnetic field and the precessing signal observed. Use is made of experience already obtained in techniques for polarizing He3 by optical pumping, obtaining long nuclear relaxation times, obtaining very low homogeneous and stable magnetic fields inside superconducting shields, fabricating and testing quartz gyro housings and using SQUID magnetometry for gyro readout. The first part of the effort will concentrate on construction and testing of the instrument, which is to render data for its evaluation as a candidate for an all-cryogenic inertial measuring unit together with cryogenic gravity gradiometers and accelerometers already under development under AFOSR sponsorship.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0008, SYSTEM MODELING AND STATISTICAL DATA PROCESSING

T. Kailath, Stanford University, School of Engineering, Dept. of Electrical Engin, *Stanford, California* 94305 (DF038860; F44620-74-C-0068)

AF function - to advance the design of electronic communications, control and sensor systems needed by the Air Force. Deficiency - the classical methods in circuit design are not sufficient for the modern digital integrated circuit types of filters, and increased demands for sophisticated capabilities require better algorithms for signal processing. Objective - to develop new techniques in estimation and detection, to exploit the results of scattering theory to least squares estimation, and to extend the theory of nonstationary processes. How work contributes - success in this program would substantially increase the signal processing capabilities of future Air Force systems.

Work will continue in the areas of fast algorithms, scattering theory, multivariable systems theory, and innovations processes.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0009, DYNAMIC SYSTEMS

D.G. Luenberger, Stanford University, School of Engineering, Dept. of Electrical Engin, *Stanford, California* 94305 (DF046370; AFOSR-77-3141)

AF function - the design and integration of electronic systems and aerospace vehicles. Deficiency - the optimal design of complex systems is hampered by the problems of effectively interfacing constituent parts and subsystems. Although the state space basis of dynamic systems and their optimal configuration are now well developed, the application of these principles to even moderately complex problems is often too difficult for cost-effective implementation. Objective - to develop systematic theories of approximations, and to unify the existing useful design methods that have evolved from ad hoc ideas. How work contributes - progress achieved in this area would permit more sophisticated and powerful systems to be designed and built in a cost-effective manner.

The initial efforts will consider three interrelated projects - positive systems, aggregation, and information simplification. Positive systems arise frequently in practice, and the theory is the most advanced here. Therefore, the known results can serve as a standard for comparison in treating other systems. The theory can be used as a tool also in investigating the long-standing problem area of aggregation. The topics of information simplification can be attacked by methods of aggregation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0010, ACOUSTIC MICROSCOPY FOR NONDESTRUCTIVE EVALUATION OF MATERIALS

C.F. Quate, Stanford University, School of Engineering, Dept. of Electrical Engineering, *Stanford, California* 94305 (DF053080; F49620-78gC-0098)

AF function - the maintenance and quality assurance of flight vehicles relies heavily on nondestructive evaluation (NDE) of critical metallic components. Deficiency - there is a deficiency in techniques to specify size, shape, and orientation of flaws in structural materials which initiate catastrophic failure. Objective - the objective of this research is to develop acoustic imaging techniques and to establish the role of acoustic microscopy in NDE for structural materials. How work contributes - this research will provide an instrument and techniques for its use in NDE for structural materials.

Scanning acoustic microscopes, the underlying theory of their operation and data analysis will be perfected for the NDE of binary alloys and other compounds, microcracks, strains, adhesions, and corrosion and anodic films.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0011, AUTOMATIC TERRAIN SEPARATION SENSING PARACHUTE ACTUATOR

D. Goodrich, U.S. Dept. of Defense, Navy, National Parachute Test Range, *El Centro, California* 92243 (DN895418)

The objective of the program is to supply the Navy with a parachute actuator which will automatically open a parachute at safe altitude above ground level, thus reducing the time of exposure to a hostile environment to a minimum.

Literature search to determine state of the art/body of knowledge relevant to candidate altitude detection concepts, such as radar and terrestrial electrical potential gradient. Let study contract with research laboratory (academic or industrial) to investigate methods and procedures for utilizing current technology to accomplish sensing; device methods for packaging into minimum space; evaluate feasibility of incorporating into fleet operations.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0012, TURBOJET TEST CELL AERODYNAMICS AND EMISSION LEVELS

D.W. Netzer, U.S. Dept. of Defense, Navy, Naval Postgraduate School, *Monterey, California* 93940 (DN898053)

(a) To experimentally determine the effects of test cell design, engine operating conditions and fuel additives on the physical characteristics of emitted particulates. (b) To compare results from current smoke opacity measuring devices with quantitative data on particulate size, concentration and composition. (c) To validate the two-dimensional test cell model using both subscale and full-scale test cell data.

(a) Measure exhaust stack particulate levels (size, concentration, opacity, composition) as a function of the following variables; tailpipe stagnation temperature and pressure, cell augmentation ratio, augmentor teritary air injection, tailpipe particulate levels, and concentrations of fuel additives. Use data to determine optimum methods for reduction of particulate emissions. (b) Correlate opacity measurements with quantiative data on particulate size, concentration and composition. (c) Validate the updated two-dimensional computer code for test cell.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

4.0013, COMMUNICATIONS - VECTOR ELECTRIC FIELD MEASUREMENTS ON BALLOONS AND SATELLITES

F.S. Mozer, University of California, Berkeley Campus, Space Sciences Lab., *3 Leuschner Observatory, Berkeley, California* 94704 (DN724005; N00014-75-C-0294)

The precipitation of energetic particles into the ionosphere causes degradation and disruption of naval communications, surveillance, and navigation systems including scintillation of satellite signals, fading and absorption of HF, ELF, and VLF signals, and auroral clutter on HF, VHF, and UHF radars. The effects are greatest both in magnitude and geographical extent during geomagnetic disturbances. The purpose of this research is to develop the better understanding of the mechanisms responsible for particle acceleration, for particle precipitation, and triggering of geomagnetic storms required to provide deterministic forecasts of propagation disturbances.

In situ measurements of AC and DC electric and magnetic fields, plasma density irregularities, and plasma density and temperature are taken by the ONR 104 experiment on the high-altitude polar orbiting satellite S3-3. These data are analyzed to determine the cause of auroral particle acceleration, field aligned currents, EXB motions, and the causes of ionospheric irregularities.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0014, ANALYTICAL METHODS USED IN THE EVALUATION OF THERMAL PROTECTION SYSTEMS FOR REENTRY VEHICLES

A.F. Mills, University of California, Los Angeles Campus, School of Engineering & Applied Science, Dept. of Engineering, *405 Hilgard Ave., Los Angeles, California* 90024 (DF042450; AFOSR-76-2931)

Air Force function - advanced ballistic reentry systems (ABRES) design and development. Deficiency - radiant and convective heat transfer and ablative shape change depend strongly upon the behavior of laminar to turbulent flow transition on reentry nose tips. This area is the subject of intensive research activity by a number of investigators since understanding of the field is not satisfactory. The field is somewhat hampered by the fact that no systematic compilation of the state of knowledge in it exists in the form of a monograph or textbook which can be used by the beginning engineer or junior officer taking on technical responsibilities for reentry system design and development. Objective - to provide a monograph which can be used for instruction as well as a reference work to fill the need stated. How contributes - a set of lecture notes, prepared for a series of lectures engaged by a prominent aerospace company for the instruction of its technical personnel working in this area, will be expanded and used as the outline for a monograph which will be made available for wide distribution within the aerospace community to fill this reference need among engineering personnel.

A systematic review and evaluation of analytical methods used in the heat and mass transfer analysis of thermal protection systems for reentry vehicles is to be made. Extension of the current methods to include recent observations and data will be made where possible.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0015, TRANSPORT CHARACTERISTICS OF MOS INVERSION LAYERS

A. Madhukar, University of Southern California, School of Engineering, Dept. of Materials Science, *3551 University Ave., Los Angeles, California* 90007 (DF051070; AFOSR-78-3530)

AF function - microwave electronic solid-state devices are essential components of Air Force reconnaissance, electronic countermeasures and communications systems. Deficiency - one of the most promising device configuration in use today is the metal-oxide-semiconductor field effect transistor (MOS-FET). However, at the present time not enough is understood concerning the various mechanisms which influence the electronic transport characteristics, and hence the device performance, of these MOS-FETs. Objective - the objective of this research is to extend the theoretical work already being performed in silicon into the area of the III-V semiconductor systems. An emphasis will be placed on understanding the dependence of carrier mobility on various inversion layer parameters and on the implications of various scattering mechanisms for the mobilities and carrier effective masses in the MOS-FET. How work contributes - this work will advance the state-of-the-art by providing a better theoretical understanding of how material parameters influence device performance and possibly by revealing new interaction mechanisms which may have important device applications.

A theoretical investigation of the scattering mechanisms which govern the transport characteristics of metal-oxide-semiconductor inversion layers will be conducted. The approach to be taken is one of testing the theoretical models with the available data (mostly in the Si-SiO2 literature) and then extending these models to the III-V compound semiconductor systems. Specifically, with respect to both electron-electron and impurity scattering, it is not clear that the usual approximations for bulk (and hence 3-D) configurations are valid for the MOS inversion layer which is essentially a 2-dimensional system. The validity of these assumptions also has to be questioned when it is noted that in the inversion layer situation, the carrier density can be varied by several orders of magnitude as the applied voltage is changed. The new model to be developed will take into account both the 2-D and carrier density variation problems. Preliminary work has also shown that the electron-phonon interation has an important influence on inversion layer mobility and the new model will incorporate this previously neglected interaction mechanism. Finally, the model will incorporate the situation where a magnetic field is present. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0016, ION IMPLANTED LASER ANNEALED TERNARY III-V MICROWAVE FET

R. Bell, Varian Associates Inc., *611 Hansen Way, Palo Alto, California* 94304 (DN875459; N00014-78-C-0380)

This work seeks to provide techniques to improve the noise figure and upper frequency of response of transistors used in Navy communications, ECM, and radar systems.

Gallium indium arsenide semiconductor layers grown on semi-insulating gallium arsenide substrates will be ion implanted, laser annealed, and quenched. The resulting morphological structure will be fabricated into microwave field effect transistors and compared to more conventional structures.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0017, TURBULENCE AND LARGE-SCALE MOTIONS IN IONIZED GASES

M.S. Uberoi, University of Colorado, Boulder Campus, School of Engineering & Applied Science, Dept. of Aerospace Engineering Science, *1200 University Ave., Boulder, Colorado* 80302 (DF042950; AFOSR-76-2964)

AF function - operation of high-altitude vehicles in a post nuclear explosion environment, development of electromagnetic weapons, space and ionospheric communications as well as countermeasures, demand the fundamental understanding of energy transformation processes occurring in plasmas specifically turbulence and large-scale motions in ionized media. Deficiency - the aforementioned information required for the design of advanced equipment is not available today. Its acquisition may be realized by a well-planned theoretical and experimental research program. Objective - this project will investigate the fundamental aspects of turbulence as they apply to high-power, high-efficiency lasers, plasma x-ray sources, heating of turbulent plasma by electromagnetic radiation, ionospheric turbulence and turbulence generated by electron and ion beams. Contribution - this work is a part of a comprehensive program of plasma research for the development of an x-ray radiation source for simulation of nuclear weapon effects, the development of advanced electromagnetic weapons (laser and particle beam), the development of space and ionospheric communications, and the development of countermeasures.

This project will investigate the physical mechanisms which drive large-scale motions in plasmas and their effects up on the plasma properties. In particular, it will study the scales or spectra of the motions and their effect upon the transport properties such as diffusion of charged particles and electrical conductivity. Both theoretical and experimental work will be performed. The main objectives to be examined are (a) the motions caused by electromagnetic effects, specifically (1) in a current-carrying plasma the electromagnetic forces are often rotational and cannot be balanced by potential pressure forces, which leads into eddying motion degenerating into turbulence, (2) in a weakly ionized gas when the current is carried by ions a neutral gas motion is set up. This 'electric wind' can change the current-voltage relation for discharges (especially in multi-electrode); and (b) turbulence generated by instabilities, specifically 1) the case of a positive column in a uniform axial magnetic field, where scales and spectra of electron fluctuations will be investigated and their relation to the plasma transport properties, and 2) the case of pulsed discharges where the current sheet becomes unstable. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0018, FRACTURE MECHANICS RESEARCH

D.L. Jones, George Washington University, School of Engineering & Applied Sciences, Dept. of Civil Mechanical & Env Engin, *725 23rd St. N.W., Washington, District of Columbia* 20037 (DN890104; N00019-78-C-0301)

Program will investigate further applications of the nonlinear energy fracture toughness criterion to cyclic loading situations and determine the effect of crack angle on fracture load and fracture toughness.

Study nonlinear energy toughness, GFC of several materials including 7050 and 2024 t3 to examine the variation in GFC for structures containing cracks. Cyclic life would be increased to more nearly approximate the range experienced by aircraft structures.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0019, ELECTRICALLY EXCITED LASERS

W.S. Watt, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN620092)

The Department of Defense has need for efficient, compact laser sources for applications such as communications, ranging, detection and navigation. Electrical excitation is projected to preferentially populate excited states in atoms and molecules and hence to provide the population inversions necessary for laser development.

Electron-beam, electron-beam sustained and other electric-discharge techniques are being investigated for CW and pulsed laser source development. The physics of electron and ion collisions are studied to understand the underlying atomic and molecular excitation processes. The use of gasdynamic techniques to create or increase population inversions is studied.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0020, DEVELOPMENT OF AN AUTOMATED ADAPTIVE TRAINING SYSTEM FOR BASIC INSTRUMENT FLIGHT

R.M. Johnson, Appli Mation Inc., *1000 Woodcock Rd., Orlando, Florida* 32803 (DN494029; N61339-74-C-0141)

Develop a refined and expanded version of an automated adaptive instruction module for basic instrument flight training as presented in ground-based simulators. For purposes of preceding studies, in which the technical feasibility of implementing automated adaptive methodology was demonstrated, a training course made up of isolated tasks loosely derived from typical syllabi was adequate. Prior to implementation for testing in an operational environment, however, it is appropriate to supplement earlier findings by demonstrating a system utilizing a complete automated syllabus closely corresponding to current syllabi in use at operational training sites.

Conduct a thorough analysis of current syllabi in operational use by training squadrons; design and implement a training course to reflect impact of automated adaptive techniques and to cover the full range of tasks and skills which can be realized by synthetic training for basic instrument flight; install and demonstrate the system on the Naval Training Equipment Center's TRADEC (research simulator) Facility; carry out an evaluation experiment to measure effectiveness.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Human Factors Lab.

4.0021, SPACE/FREQUENCY CONVERSIONS IN IMAGE TRANSMISSION AND PROCESSING

W.T. Rhodes, Georgia Inst. of Technology, School of Engineering, Dept. of Electrical Engineering, *225 North Ave. N.W., Atlanta, Georgia* 30332 (DF053640; AFOSR-78-3720)

AF function - advanced terminal guidance processors will permit maneuverable reentry vehicles to take evasive action while ensuring accuracy of delivery. Opportunity - the fundamental difficulty in achieving a practical terminal guidance system lies in real-time correlation of the stored reference image with an input image that differs in scale, aspect, contrast, and even content when sensed in a different spectral band or at a different time then the reference image. The most promising technology is optical processing with its increasing repertoire of space-variant data processing operations. Objective - the proposed research will investigate a space coordinate-to-temporal frequency mapping technique that should allow a one-to-two-orders-of-magnitude increase in the number of full frame correlations that can be performed per second on a one million pixel image. How work contributes -this effort will advance optical processors for terminal guidance applications.

A pair of crossed acoustooptic cells driven by periodic waveforms will be investigated as a method of realizing the required image encoder. Characteristics and limitations of both coherent and incoherent decoding techniques will be studied. With regard to the processing operations, the effort will investigate trade-offs between full analog operation and partial digital implementation coupling between the optical and electronic components, and trade-offs between CCD, SAW, and intergrated optics implementation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0022, KINETICS AND SPECTROSCOPY OF AIRCRAFT AND ROCKET PLUME CONSTITUENTS

F.P. Tully, Georgia Tech Research Inst., *Atlanta, Georgia* 30332 (DF049370; F49620-77-C-0111)

AF function - defense, weapons delivery. Deficiency - reaction rate coefficients need to be reliably determined at elevated temperatures for advancement of rocket plume and aircraft combustor technologies. Objective - this work will obtain rate constants for some elementary rate-constants most in doubt in hydrocarbon combustion involving free radicals, and for oxidations of boron halides which may occur in advanced rocket propellant plumes. How work contributes - the results of this research will be used in authoritative AFOSR standard reference kinetic data tables, which in turn will provide development engineers with the required information in such areas as chemical emissions from air-breathing engines (Research Objective 5.2.6.1) and advanced rocket plumes (Research Objective 5.1.2).

Flash photolysis followed by laser-induced fluorescence spectroscopy will be used to measure the rate constants of hydroxyl radical reactions with hydrogen, methane, formaldehyde and carbon monoxide in appropriate temperature ranges up to 1200 K. The stop-flow time-of-flight mass spectrometry technique will be used to study mechanisms and rate constants of boron halide reactions with oxygen, in a limited temperature range.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0023, MODULAR AVIONICS PARTITIONING CONCEPTS

R.H. Huss, U.S. Dept. of Defense, Navy, Naval Avionics Facility, *Indianapolis, Indiana* 46218 (DN697009)

To provide a modular packaging definition compatible with the system partitioning requirements of future high-density electronics in high-performance platforms. An adequate modular packaging definition will permit the further development of standard functional modular packaging in a manner which can achieve simultaneously reasonable goals in high-density, high-reliability, adequate performance, and low life-cycle cost. Top down functional partitioning is a key element in arriving at an adequate packaging definition.

Trade-off criteria will be established for packaging and functionality requirements. Based on packaging studies including a determination of the requirements and constraints imposed by various avionics platforms, standard modules and higher level packaging systems (i.e., enclosures and racks) will be defined.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0024, CORRELATION OF AXIAL-FLOW COMPRESSOR AND FAN CASCADE DEVIATION ANGLES BY ANALYSIS OF BLADE SURFACE BOUNDARY LAYER CHARACTERISTICS

G.K. Serovy, Iowa State University of Science & Technology, School of Engineering, Dept. of Mechanical Engineering, *496 Town Engineering Bldg., Ames, Iowa* 50011 (DF052340; AFOSR-78-3609)

AF function - advanced turbomachinery. Opportunity - improved understanding of flow through an axial flow turbojet engine. Objective-development of a deviation angle prediction method for advanced compressor and fan cascade configurations. How work contributes - would provide better flow angle distribution and losses for use in design and performance predictive methods for advanced axial flow compressors. This will result in better engine designs.

Experimental data for compressor cascade deviation angle will be obtained, reviewed and processed as required for quantitative comparison. Computed values based on a recently developed prediction system will be obtained for similar test case sets. The combined computed and experimental test case sets will then be used as a basis for an attempt to modify the presently used method.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0025, WIND TUNNEL SHOCK STUDY

M. Finston, Massachusetts Inst. of Technology, School of Engineering, Dept. of Aeronautics & Astronautics, 77 *Massachusetts Ave., Cambridge, Massachusetts* 02139 (DF247430; F19628-76-C-0185)

AF function - communication and radar survivability of Air Force systems such as the B-1, AABNCP, AWACS, BMEWS, OTH-B and DSP under naturally disturbed and nuclear environments. Objective - to determine shock wave effects on d-region ion composition measurements. How research contributes - information on shock wave position relative to the eeasurement probe will confirm a payload geometry for obtaining reliable d-region data which is relevant for communications and radar survivability studies.

An investigation, including wind-tunnel measurements, will be made to determine shock wave position as a function of Mach number and angle of attack to determine attached shock conditions (areas of reliable data acquisition) and detached shock conditions (isolating problem areas in data acquisition).

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

4.0026, PROPAGATION OF TRANSIENT SIGNALS THROUGH NONLINEAR, IONIZED MEDIA

R.E. McIntosh, University of Massachusetts, Amherst Campus, School of Engineering, Dept. of Electrical Engineering, *Amherst, Massachusetts* 01002 (DF039780; AFOSR-78-3729)

AF function - operation of high-altitude vehicles in a post nuclear explosion environment, development of electromagnetic weapons, space and ionospheric communications as well as countermeasures demand the fundamental understanding of interaction of electromagnetic signals and ionized media. Deficiency - the aforementioned information required for the design of advanced equipment is not available today. Its acquisition may be realized by a well planned theoretical and experimental research program. Objective - this research will attempt to understand the effect that plasma inhomogeneity, dispersion, nonlinearity, anisotropy and nondeterminacy have on the propagation of electromagnetic sources and thus obtain data for the design of iono-

spheric and space communication systems. Contribution - this work is a part of a comprehensive program of plasma research for the development of an x-ray radiation source for simulation of nuclear weapon effects, the development of advanced electromagnetic weapons (laser and particle beams), the development of space and ionospheric communications, and the development of countermeasures.

This project will investigate the following areas - (a) Heating and ionization of gases by electromagnetic pulses, specifically, 1. Improve the computer simulation of microwave breakdown of gases inside the test system, 2. Refabricate the test system to reduce contaminants, 3. perform microwave breakdown measurements and compare them with computed values, 4. Complete the high intensity spark gap generator for use as a short duration dc pulse source, 5. Modify the computer simulation to include emp type pulses and compare them with measurements. (b) Ionospheric channel modeling of pulse transmission, specifically, 1. refine the ionospheric model, 2. Measure Doppler and delay spectra of HF signals reflected from the ionosphere, 3. Simulate large-scale disturbances (e.g., gravity waves) in the ionosphere, 4. Develop channel models for communication between two points in the ionosphere and a point on the earth and a point in or above the ionosphere, 5. Extend the HF ionosphere channel model to microwave frequencies.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0027, OPTIMUM SINGULAR AERODYNAMICS AND THRUST MAGNITUDE MATCHING IN SUPERCRUISE

N.X. Vinh, Michigan State University, School of Engineering, Dept. of Aerospace Engineering, *Engineering Bldg., East Lansing, Michigan* 48824 (DF051710; AFOSR-78-3555)

AF function - design opumum flight profiles. Deficiency - the optimum flight profile for maximum range with a given fuel load changes with a minimum time constraint. Objective - the objective of this proposal is to investigate the optimum aerodynamics of a supercruiser and its matching with the singular thrust control to minimize the fuel consumption over a prescribed range under a certain time constraint. How work contributes - results in this study will aid in the design of a supercruiser fighter.

The theory for singular aerodynamics and thrust controls with time constraint will be developed. Quantitative analysis will be carried for the supercruiser concept and minimum fuel consumption to cover a prescribed range will be obtained as a function of the prescribed cruising time. It is expected that optimum Mach number will move to supersonic range. In a three-dimensional space representing the fuel weight, range, and time the reachable domain for the example aircraft can be plotted. The limitation in the range, as the time for cruising flight decreases, is then explicitly displayed. The reachable domain is obviously a function of engine performance, and aerodynamic characteristics. The remaining problem to be investigated is how to configure aerodynamically the aircraft in supersonic performance to extend the range without compromising its transonic maneuvering requirements in the combat arena.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0028, ELECTROMAGNETIC SCATTERING

T.B. Senior, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Electrical & Computer Engineering, *Ann Arbor, Michigan* 48104 (DF047000; AFOSR-77-3188)

AF function - radar scattering cross section reduction for aerospace vehicles. Opportunity - radar absorbing surface coatings reduce cross section. Objective - to reduce not only specular but also nonspecular or diffracted contributions to scattering cross section. How work contributes - by examining the effect that surface coating impedance has on travelling, creeping, and edge waves, edge reflections, etc.

Three research areas seem promising. First, numerical algorithms for cross section reduction for a edged finite body are now limited to low frequencies. More economical higher frequency schemes will be sought. Second, analytic solutions to half planes with layered anisotropic impedance coatings and obliquely incident radiation will be sought through an extension of Hurd's Wiener Hopf technique. Such solutions may serve as canonical local solutions or finite elements for more general approaches. Third, studies of low frequency scattering by absorber and dielectric coated structures will use the polarization tensor approach. Applications will be made to ice crystals and aerosols.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0029, NUMERICAL SOLUTION OF THE MEAN TURBULENT FLOW EQUATIONS FOR FLOW ABOUT ARBITRARY AIRFOILS

Z.U. Warsi, Mississippi State University, School of Engineering, Dept. of Aerospace Engineering, *Suite 101 Engineering Bldg., Mississippi State, Mississippi* 39762 (DF042220; AFOSR-76-2922)

AF function - the design of more effective reentry vehicles and conventional projectiles. Opportunity - new mathematical transformation techniques are presently available for use in the computation of complete flow fields. Objective-this research effort will utilize those transformation techniques and expand their utility to solve more complex flow problems. How work contributes - numerical techniques for the solution of mean turbulent flow equations for flows past arbitrary airfoil sections and for 3-D laminar flows will be developed for use by Air Force laboratories.

The continuing effort under this proposal is the development of a numerical solution of the full mean turbulent flow equations without boundary layer or thin shear layer approximation. The ultimate goal is a turbulent solution for arbitrary 3-D bodies which can accurately predict separated and recirculating wake flows. This effort is to (1) convert to the primitive variable formulation of the solution in preparation for extension to three dimensions, and continue development of the turbulent solution based on the two rate equation turbulent model and begin the extension of this solution to 3-D, (2) develop the turbulent solution based on the six rate equation model in 2-D for comparison of economy and accuracy with the two equation model, (3) continue development of the 3-D coordinate code, (4) develop a fully implicit 3-D laminar Navier-Stokes solution, and (5) improve the graphical display of 3-D results.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0030, UNSTEADY TRANSONIC FLOWS IN A TWO-DIMENSIONAL DIFFUSER

M. Sajben, McDonnell Douglas Corp., *P.O. Box 516, St. Louis, Missouri* 63166 (DF048360; F49620-77-C-0082)

AF function - advanced aerospace vehicles. Opportunity - increase our fundamental knowledge of the parameters which cause dynamic inlet distortion. Objective - the first objective will be to explore experimentally the effects of approach boundary layer properties on the unsteady behavior of two-dimensional, transonic diffuser flow. Upon completion of this, the response of diffuser flows to unsteady perturbations introduced downstream of the diffuser will be experimentally explored. How work contributes - understanding of the mechanisms responsible for the flow unsteadiness will provide the basis for establishing scale laws and developing inlet-compressor matching methods that are based on fundamental principles of fluid mechanics.

Appropriate hardware will be designed and built to permit varying the thickness of the boundary layer approaching the inlet throat. A matrix of test parameters will be established adequate to cover all significant fluctuation modes. Oil flow traces and high speed Schlieren movies will be used as visualization techniques. All data will be analyzed and correlated. Upon completion of this phase hardware will be designed and built which will permit the introduction of external, nearly sinusoidal perturbations at the diffuser exit. A new matrix of test parameters will be established to cover a range of realistic perturbation amplitudes and frequencies and pressure ratios. Data will be collected, analyzed and documented in a form suitable for comparison with theoretical prediction methods.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0031, ANALYTICAL STUDIES OF TURBULENT FLOW FIELDS

G.L. Mellor, Princeton University, School of Engineering & Applied Sciences, Dept. of Aerospace & Mech Science, *Box 430, Princeton, New Jersey* 08540 (DF028700; AFOSR-75-2756)

AF function - advanced aerospace vehicles. Opportunity - increase capability for predicting separated turbulent flow problems. Objective - to develop a theoretical model and a numerical method useful for solving fully separated turbulent flows produced by steps, flat plates, and adverse pressure gradients normally encountered on lifting surfaces. How work contributes - improvement in predictive ability will permit better design of any system (airfoils, inlets, compressor and turbine blades) in which separated flows are important.

A second moment turbulence model centered on hypothesis by Rotta and Kolmogorov has been developed to handle fully separated flows. Various separated flows will be examined and predictions compared to available experimental data. These will include flows where curvature effects are dominant, unsteady (ensemble mean) flows over bluff bodies, and internal waves in density stratified flows.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0032, DEVELOPMENT OF FUTURE AIR DYNAMOMETER SYSTEMS

W.P. Sule, U.S. Dept. of Defense, Navy, Naval Air Engineering Center, *Lakehurst, New Jersey* 08733 (DN696015; N68335-75-C-2098)

To develop air dynamometers for use as load-absorbing devices for the ground testing of turboshaft engines.

Analytical and model testing will be used to advance the state-of-the-art in air dynomometer technology to produce the design data needed to develop future test system as new engines become operational.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0033, THEORETICAL STUDIES OF THREE-DIMENSIONAL TRANSONIC FLOW THROUGH A COMPRESSOR BLADE ROW

W.J. Rae, Calspan Corp., *1422 Genesses Ave., P.O. Box 235, Buffalo, New York* 14221 (DF051940; F49620-78-C-0057)

AF function - advanced turbomachinery. Opportunity - improvement of present methods for predicting flow through an axial flow compressor. Objective - to develop a numerical method for calculating the inviscid three-dimensional flow field in a transonic compressor for cases in which the blades are highly loaded. How work contributes - will provide a basis for improving present empirical techniques used in designing advanced axial flow compressors and fans.

A capability now exists for calculating the three-dimensional flow through a row of compressor blades within the approximation of nonlinear small disturbance theory. In this program the full nonlinear potential equation will be solved. Techniques to handle the boundaries (blade surfaces), periodicity and far-field conditions will be developed. Treatment of the vortex sheet contributions to the potential will also be devised. Finally, all these techniques will be incorporated into a procedure which will yield solutions for inviscid, three-dimensional fully nonlinear potential flow through a highly loaded compressor blade row.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0034, TRANSITION PROBABILITY AND PRESSURE BROADENING PARAMETERS OF COPPER ATOMIC LINES

W.H. Wurster, Calspan Corp., *1422 Genesses Ave., P.O. Box 235, Buffalo, New York* 14221 (DF133750; F33615-75-C-3082)

Performance of high-speed ballistic missiles has outpaced the capability of ground test facilities to simulate the severe conditions encountered during reentry. A significant technical lag exists in the area of thermal measurement instrumentation. The objective of this effort is to generate fundamental spectroscopic data which is required as input information to thermal measurement techniques presently under development for ground-based test facilities. Successful development of quality ground based facilities will significantly reduce the amount of free flight testing required, thus significantly reducing the cost of new reentry technology.

The high temperatures of the gas in the nose tip region of reentry models make a direct physical measurement of the gas temperature extremely difficult. Therefore, a spectroscopic diagnostic technique to measure the nose tip gas temperature is under development. This technique uses the intensity of two spectral lines of a flow contaminent, copper. In order to relate these copper spectral line intensities to the nose tip gas temperature, fundamental spectroscopic atomic data is required (i.e., transition probability and line broadening parameters). It is the function of this contract effort to have these copper atomic properties measured using a test facility whose thermal properties are already known accurately.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

4.0035, SOLID-STATE MATERIALS DERIVED FROM PLANAR COMPLEXES

L.V. Interrante, General Electric Co., *1 River Rd., Schenectady, New York* 12305 (DF041500; F44620-76-C-0006)

AF function - future Air Force flight operations require improved electromagnetic devices for use in flight control, reconnaissance and surveillance, signal processing and control, and environmental support. Deficiency - a need exists for new materials which can be exploited for the design of new concepts and classes of electronic and magnetic devices. Objective - to obtain the understanding and predictive capability necessary for effective utilization of the unique features of existing transition metal complexes in solid-state applications and to permit purposeful synthesis of new materials for satisfying the requirements. How work contributes - new electromagnetic materials will be synthesized and their properties identified.

The research focuses on the synthesis of new solid-state materials, combining planar organic and transition metal complexes, and the characterization of their structures and physical properties.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0036, PHOTOMETRIC SATELLITE IMAGING (RADC POST DOC)

J. Posdamer, Syracuse University, L.C. Smith College of Engineering, Dept. of Computer & Information Science, *Link Hall, Syracuse, New York* 13210 (DF916060; F30602-75-C-0121)

The objective of this effort is to determine the feasibility of generating three-dimensional images of distant space objects using one-dimensional photometric satellite signatures.

By computing the corresponding cross-sectional area associated with light intensity reflected from unknown space objects, and by calculating dynamic object orientation as a function of time, it may be possible to graphically construct an image of an object.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0037, TARGET MODULATED SIGNATURES

J.F. Lennon, U.S. Dept. of Defense, Air Force, Rome Air Development Center, *Griffiss Air Force Base, Rome, New York* 13441 (DF902850)

This effort is intended to address topics in the area of advanced radar detection and identification. Deficiency - there is a need for enhanced radar techniques for identification of noncooperative targets. Objective - the objective of the research is to examine the interaction between radar signals and targets especially those having cyclic structural or substem motions and/or characteristic resonances which may be observable by ground-based radars. The possibilities of using resultant radar characteristics for identification will be assessed.

Theoretical analyses will be carried out on models representing general classes of periodic motions to ascertain the types of modulations induced on radar signal by the various sources. A computer program will be employed which uses three dimensional configurations of crossed wires to simulate aircraft with wing flutter and structural motion characteristics. Calculated phase changes in the scattered signal from the various target classes will be examined over ranges of radar frequency, aspect angle, periodicity, and configuration. Experimental measurements of complex targets will determine predominant types of modulation, frequency response features, polarization sensitivity, persistency, and levels relative to the principal radar cross section at skin line return.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0038, C-LAYER PROPAGATION FOR LONG WAVE COMMUNICATIONS/NAVIGATION

J.E. Rasmussen, U.S. Dept. of Defense, Air Force, Rome Air Development Center, *Griffiss Air Force Base, Rome, New York* 13441 (DF904010)

The objective of this effort is to evaluate the significance of the lower ionosphere's c-layer on long wave electromagnetic propagation technology for Air Force communications, navigation and detection systems. AF function - communications, navigation and detection in the long wave radio spectrum. Deficiency/opportunity - improve the range and reliability of VLF/LF communications. Improve the accuracy, predictability, and reliability of VLF (omega) navigation systems. How research contributes - provides the experimental measurements and theoretical modeling required to understand long wave radio propagation and to determine the engineering parameters critical to VLF/LF system design.

The propagation of VLF and LF radio waves is primarily a function of the reflectivity of the lower ionosphere. The existance and influence of the c-layer in VLF/LF propagation is an extremely controversial subject with the only direct observations being a very limited sample obtained by RADC/EEP at mid-latitude. Under this work unit c-layer measurements will be conducted utilizing RADC/EEP's high resolution ionosounder to verify the existance of a descrete layer in polar regions and determine the diurnal stability of c-layer propagation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0039, TIME-DEPENDENT HYPERSONIC VISCOUS INTERACTIONS

E. Reshotko, Case Western Reserve University, School of Engineering, Dept. of Fluid Thermal & Aerospace Sci, *University Cir., Cleveland, Ohio* 44106 (DF051540; AFOSR-78-3562)

AF function - aerospace vehicles. Deficiency - lack of knowledge of effects of free stream turbulence on boundary layer stability behavior. Objective - to develop analytical procedures for predicting boundary layer transition due to blunt tip vehicle configurations. Also, evaluation of the influence of test facilities on boundary layer transition at supersonic and hypersonic speeds will be accomplished. How work contributes - this research is part of a comprehensive program in turbulence and turbulent flow to provide a better understanding of the phenomena so that the effects can be considered in the design of advanced aerospace vehicles.

The disturbance equations of a blunt supersonic vehicle will be studied analytically to evaluate the effects of bluntness on the stability of the vehicle boundary layer. Also, the influence of the test facility on boundary layer transition will be studied.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0040, OPTIMIZATION OF SYSTEM DIAGNOSTIC AND FAULT ISOLATION PROCEDURES

T.J. Sheskin, Cleveland State University, School of Engineering, Dept. of Industrial Engin, *1983 E. 24th, Cleveland, Ohio* 44115 (DF051230; AFOSR-78-3496)

AF function - to establish test procedures for the most cost effective maintenance of complex electronic equipment, in aircraft and space vehicles and on the ground. Deficiency - because of their increased complexity and sophistication, modern electronic systems require large amounts of time and effort to repair and maintain. Some integrated circuits are so complicated that it is impossible to test all of their components or circuits. Objective - to design cost-effective diagnostic and fault isolation procedures for military electronic equipment. How work contributes - success in this research effort would result in faster and cheaper repairs or replacements, and therefore more reliable aircraft, weapons systems, and sensor and communications systems. In addition, the goal of automated diagnosis and reconfiguration would be brought nearer.

The plan is to investigate the use of optimization algorithms for the development of efficient, cost-effective diagnostic and fault isolation procedures. Such optimization tools will include dynamic programming, integer programming, and heuristic methods.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0041, COMPRESSOR/TURBINE INSTRUMENTATION AND TRANSIENT ANALYSIS EQUIPMENT

D.L. McCormick, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF451960)

To purchase high-response instrumentation and data acquisition and handling equipment for use in the in-house test programs, i.e., T-63 compressor stability investigation, J-85 control synthesis program and adequate building of equipment to meet the needs of the compressor research facility. To maintain a forward-looking evaluation and development program for new instrumentation and sensors for possible use in engine research and development testing.

Determine future instrumentation needs of turbine engine research testing, purchase the most compatible equipment, design an operable system, supervise installation in rooms 17 and 21, and prepare operating instruction handbook. Conduct detailed performance tests of critical subsystems as installed and prepare AFAPL TR based on results.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

4.0042, SPECIFIC MISSILE MODEL

H. Carlstrom, U.S. Dept. of Defense, Air Force, Avionics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF099730)

To study and evaluate the performance of various missiles (A A plus S A) against ECM and also by applying fixes (ECCM) on the missile side to observe the degradation of the ECM. As far as possible real flight conditions will be simulated, the output will be either misdistance or closely related misdistance.

This in-house approach will utilize a Hawk missile to represent the threat. There are reasons to believe that the Hawk is a good representative of the class of semiactive guided missiles now widely in use. With the available hardware, one missile guidance section and one maintenance shop trailer, a functioning missile model will be set up in the anechoic chamber facility and readied for ECM tests.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0043, RECONNAISSANCE AND WEAPON DELIVERY DIVISION SENSOR SYSTEM AND IMAGE ANALYSIS

E.L. Gliatti, U.S. Dept. of Defense, Air Force, Avionics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF093550)

To process, maintain, and develop methods and applications of performing reconnaissance and/or weapon delivery related sensing system evaluations. Included in this are digital and analog computer analysis of flight environment and simulation, and microdensitometer and/or special equipment to perform imagery/display evaluations. These efforts are directed toward economically analyzing system and subsystem performance prior

to flight and post-mission analysis and to various advanced imagery/display evaluation techniques such as edge analysis for determination of resolution capabilities.

This effort utilizes several advanced computer programs for processing vibration and rate gyro information into frequency spectrums, time amplitude, statistical analysis, and other analytic techniques useful in determining the environment of a reconnaissance or weapon delivery sensor and simulating this combined motion for flight performance prediction. Also, other special computer program process scanned imagery/display to develop the statistical results sufficient to evaluated imagery/display quality. This work unit additionally covers the maintenance and improvement of equipment and software.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0044, STATIC AEROELASTIC ANALYSIS INCLUDING CHORDWISE BENDING

E. Deska, U.S. Dept. of Defense, Navy, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate, *Warminster, Pennsylvania* 18974 (DN881676)

Development of a methodology to account for chordwise bending in static aeroelastic analysis.

Existing techniques which develop aerodynamic and structural influence coefficients will be modified to provide the additional degrees of freedom which will account for the effects of chordwise bending.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0045, ADVANCED AERODYNAMIC CONCEPTS

K.T. Yen, U.S. Dept. of Defense, Navy, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate, *Warminster, Pennsylvania* 18974 (DN481077)

To conduct research in promising areas of advanced aerodynamics, i.e., technologically efficient areas of unique interest to the U.S. Navy.

Through continuing review of the aerodynamics S.O.A., identify areas of significant technological deficiency and establish priorities based upon Navy unique requirements, impact on operational effectiveness, economy of development and solution risk. Seek qualified sources to perform the work, administer study contracts and provide in-depth technical monitoring and overall program management.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0046, DEVELOPMENT OF ADVANCED AIRBORNE EXECUTIVE PROGRAM

W. Pohle, U.S. Dept. of Defense, Navy, Naval Air Development Center, Software & Computer Directorate, *Warminster, Pennsylvania* 18974 (DN881066)

Distributed computer configurations have been projected as the next generation architecture for various avionic platforms. The objective is to explore and develop new approaches for airborne executive programs to handle these configurations. The goal is an executive design which will meet the requirements of the various platform (P3 S3A V/STOL AIDS) configuration and which will provide increased reliability graceful degradation and expanded processing capability.

The approach of this effort will be to critically review project requirements and investigate alternate new approaches to the executive design. There has been little work done on multi-computer executives in the time-critical airborne environment with its associated peripheral equipment constraints. Items to be investigated are error recovery, task scheduling, processor communications and other related areas.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0047, DIRECT DOPING OF SEMICONDUCTORS

J.N. Zemel, University of Pennsylvania, School of Engineering & Applied Sciences, Dept. of Electrical Engineering, *4001 Spruce, Philadelphia, Pennsylvania* 19104 (DF049850; AFOSR-77-3432)

AF function - microwave solid-state devices are essential elements of air force communications, reconnaissance, surveillance and countermeasure system. Opportunity - as electronic devices become smaller and smaller, new technologies in device pattern generation will be required. Objective - it is the objective of this research to contribute to the development of submicron pattern generation. How work contributes - this work could lead to a simplified process for planar device fabrications.

As-S and As-Te-S-Ge chalcogenide amorphous films, which have differential chemical etching rates upon exposure to light, will be used as resists to establish patterns in these materials on the region of substrates or epitaxial films of Si and GaAs to be doped. After encapsulations, doping will be achieved by diffusing the unetched resist into the Si or GaAs to make devices.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0048, AN ANALYSIS OF THE LOGAIR DISTRIBUTION SYSTEM USING OPTIMIZATION PRINCIPLES

J.L. Kennington, Southern Methodist University, Graduate School, Dept. of Operations Research, *Hillcrest & University, Dallas, Texas* 75222 (DF046150; AFOSR-77-3151)

AF function - to administer the LOGAIR air freight network that provides the equipment and supplies required by the major USAF installations. Deficiency - the two civilian carriers make no routing or scheduling determinations. This is done by personnel at AFLC, using methods based on experience and certain estimations. The result is an arrangement that is almost surely far from best. Objective - to bring some mathematical theory of scheduling and integer programming to bear on the problem to increase the amount of freight transported or to decrease the cost of the transportation operation. How work contributes - the work would be the only theoretical effort that addresses this particular problem. Any improvement, even if not the optimum solution, would result in cost savings of millions of dollars to the Air Force.

A combinations of improved interfacing among routes, better scheduling, and alternative aircraft assignments matched to flow requirements would significantly alleviate the present deficiencies in costly abnormally long 'pipeline' times. The methods to be used are part of the science of mathematical programming.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0049, INTERDISCIPLINARY STUDY ON ADVANCED NDI TECHNIQUES

A.B. ElKareh, University of Houston, School of Engineering, Dept. of Electrical Engineering, *3801 Cullen Blvd., Houston, Texas* 77004 (DF050150; AFOSR-77-3457)

AF function - nondestructive inspection (NDI) of aircraft and ground support equipment is a vital part of the Air Force mission to detect the effects of loads and flaws. Better inspection techniques, as a product of diligent research, will provide cost-effective management for improved systems and their components. Deficiency - insufficient data exists for the dual problem of residual stress and small defects in layered structures of modern defect-tolerance-oriented design. As a result, more needs to be learned about the temperature dependence of NDI measurements and NDI techniques in general. Objective - this multidisciplinarian approach has an overall objective to develop a better understanding of NDI techniques for different materials used in varied aerospace structures. The proposed research represents an attempt to identify the important models and mechanisms that are controlling in ultrasonics, magnetic flux leakage, eddy current and microwave inspection methodologies. How work contributes - a successful yield for the planned research will contribute through a marked enhancement for better reliability and durability of typical Air Force structures.

Multidisciplinarian research using the skills of training in physics and mathematics, coupled to the capabilities offered by two academic departments (electrical engineering/mechanical engineering), will do analytical and experimental research

together in a concentrated assault to better understand the complex variables of NDI. Task A (NAM 77-086), under the direction of Dr Salama, will pursue ultrasonic challenges while Task B (NAM 77-129), directed by Dr Gardner, is devoted to flux leakage, eddy current and microwave. Both Tasks A and B will be managed by the Dean's Office through the capable direction of Dr A B El-Kareh, who offers leadership and structure-properties characterization research. Although the approach is unique (multidisciplinarian with three departments of academe working on one problem) the anticipated yield is promising.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0050, DYNAMIC SIMULATION OF COMPLEX STRUCTURES 15243-E

L. Meirovitch, Virginia Polytechnic Inst. & State University, School of Engineering, Dept. of Engineering Science & Mechanic, *Blacksburg, Virginia* 24061 (DA0F9146; DAAG29-78-G-0038)

To carry out the dynamic simulation of complex structures and produce a mathematical formulation for the study of their vibrational characteristics. Relevance - AVRADCOM conducts research in vibration and dynamic loads for helicopters in both hover and forward flight. This work is vital in the analysis of the structural dynamics which is involved. This is particularly true when gyroscopic effects of the engine, main rotor and tail rotor loads and their interactions are to be considered.

The complex structure will be decomposed into a number of substructures, both gyroscopic and non-gyroscopic, after which the method of component mode synthesis will be applied.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

4.0051, VISUAL DISPLAYS - RESEARCH ON HUMAN PERFORMANCE WITH ADVANCED ELECTRONIC DISPLAYS

H.L. Snyder, Virginia Polytechnic Inst. & State University, School of Engineering, Dept. of Industrial Engineering & Operations Research, *Blacksburg, Virginia* 24061 (DN875268; N00014-78-C-0238)

Advanced electronic displays, such as light-emitting diodes, liquid crystal displays, plasma panel, holographic lenses, and full-color CRT's, are being considered for incorporation into integrated display systems in aircraft cockpits and shipboard information centers. There is little if any information about the advantages and disadvantages of these displays or of their critical design variables, with regard to their effects on human visual task performance. This research addresses that need.

Existing human performance data and human engineering concepts relevant to these advanced electronic displays are summarized and organized to provide design engineers with guidance in making critical design trade-offs. Additional fruitful areas for research are recommended to fill gaps in existing knowledge. Initial experiments are directed towards specifying quantitative trade-offs between chrominance contrast and luminance contrast for projected displays (e.g., head-up or helmet-mounted displays) to achieve improved visual task performance.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0052, FUNDAMENTAL MODELING OF KINETICS, MIXING AND EVAPORATION IN COMBUSTORS

J. Swithenbank, University of Sheffield, *Mappin St., Sheffield, England, United Kingdom* (DF013410; AFOSR-74-2682)

AF function - advanced airbreathing engines, airborne weapon delivery. Deficiency - insufficient understanding of basic mechanisms and processes involved in advanced airbreathing combustors and lack of realistic guidelines for predicting propulsion system performance and solution of combustor design problems. Objectives - to understand and develop accurate theoretical and mathematical models realistically describing the combustion phenomena encountered in advanced airbreathing ramjet and turbojet combustors and augmentors. How work contributes -will provide additional understanding and realistic analytical modeling of turbulent reactive flow fields not now available and will contribute to establishing realistic design criteria for efficient, stable and low polluting primary and secondary ramjet, turbojet and composite engine combustors. Also will aid in understanding combustion system limitations and hence in system optimization at design stages.

Parallel theoretical and experimental studies associated with modeling of ramjet and gas turbine combustors will be carried out. emphasis will be on practical application of entrainment and turbulence theory and use of partially- and well-stirred chemical reactor theory to formulate phenomenological models for use in solution of combustor design problems. Included will be study of simultaneous influence of pressure, two-phase fluid dynamics, turbulence, unmixedness, radiative and convective heat transfer, multiple reaction chemical kinetics, fuel preparation (e.g., droplet break-up, distribution and evaporation), steady and unsteady combustion, turbulent subsonic and supersonic air flows on combustor characteristics and performance. Special attention will be given to application of the combustor analysis methods to dump combustor configurations of interest to AFAPL. Computation will be made of the 3-D flow patterns, turbulence levels, temperature profiles, wall heat transfer and fuel evaporation characteristics, combustion efficiencies and overall pressure drop. Theoretical model predictions will be verified experimentally using gas analyses, flow velocity and temperature profile measurements, laser diffraction droplet size and turbulent density spectrum analyses and quantitative turbulent mixing analyses.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, COMMUNICATIONS - IONOSPHERIC-MAGNETOSPHERIC COUPLING EXPERIMENT

E.G. Shelley, Lockheed Missiles & Space Co. Inc., Research Laboratory, *3251 Hanover St., Palo Alto, California* 94304 (DN575039; N00014-75-C-0099)

Energetic particle precipitation disrupts naval communications in all bands between ELF and VLF. The natural causes of this precipitation are associated with magnetic substorms. Anthropogenic causes include coherent VLF radio transmissions, and high altitude nuclear bursts. The nuclear-induced disturbances are far more severe and more prolonged than natural disturbances, but the full range and extent of effects has not been measured, and cannot be. The objectives of this experiment are to measure and understand the causes of natural precipitation, to better understand magnetospheric-ionospheric coupling and the cause of magnetic substorms. This knowledge may then be used to model the effects of nuclear bursts, which can be used to design communications systems resistant to disruption, and aid in planning for communications during and after a nuclear exchange.

An ion mass spectrometer and a multichannel electron spectrometer will be flown on a low altitude polar orbiting satellite, and will measure the ion mass and ion and electron energy and pitch angle disturbances between 0.1 and 30 kEv. The particle energy input and its relation to other ionospheric, magnetospheric, and atmospheric processes will be examined.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0002, BALLOON ELECTRIC FIELD MEASUREMENTS DURING THE INTERNATIONAL MAGNETOSPHERIC STUDY

F.S. Mozer, University of California, Berkeley Campus, Space Sciences Lab., *3 Leuschner Observatory, Berkeley, California* 94704 (ATM7622278A02)

This grant will continue the support of University of California balloon measurements of ionospheric and atmospheric electric fields during the International Magnetospheric Study (IMS). The grant will be used for analyses of existing data, for measurements of electric fields parallel to the geomagnetic field, and for simultaneous worldwide observations of electric fields and auroral zone parameters. These experiments will be performed in conjunction with observations of electric fields on the S3-3, GEOS, and ISEE-A satellites.

Existing data to be analyzed in the program were obtained from simultaneous observations at six balloon launch sites during four successive days in August, 1974, in a collaboration involving scientists from six countries.

The parallel electric field measurement program will use a large balloon flown from Thompson, Canada, at an altitude of about 140,000 feet. At this altitude electric fields of atmospheric origin will be small enough to allow measurements of vertical ionospheric fields whose origin lies in the E- or F-region. Ionospheric fields will be separated from those of atmospheric origin by their different altitude dependencies and by comparison of measurements on two payloads flown on the same balloon but that are separated by a vertical distance of about six kilometers.

The worldwide balloon electric field and auroral zone parameters experiment will be performed in August, 1978, at the peak of the IMS program. It will require a major collaboration of scientists throughout the world during a four-day interval when ionospheric field data will be obtained from as many as 10 balloon sites, 5 radar sites, and 3 satellites. This program will thus be an expansion of a similar but smaller-scale program performed in August, 1974.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0003, COMMUNICATIONS - IONOSPHERIC TURBULENCE AND MAGNETOSPHERIC-IONOSPHERIC COUPLING FOR EVALUATION OF RADIO COMMUNICATIONS

C.F. Kennel, University of California, Los Angeles Campus, Inst. of Geophysics & Planetary Physics, *405 Hilgard Ave., Los Angeles, California* 90024 (DN323099; N00014-76-C-0307)

The objective is to evaluate the effect of the ionosphere on radio communication systems used in Navy operations and to help in the design and operation of such systems. The propagation and attenuation of high-frequency, very low-frequency, and very high-frequency radio signals by the ionosphere, by both ground-based and satellite transmitters, are governed by the electron and ion densities in the ionosphere. The present work developes a model to estimate these electron and ion densities as a function of latitude, longitude, altitude, season, time and solar activity.

Work consists of a theoretical investigation of ionospheric plasma turbulence and magnetosphere-ionosphere interactions. Specifically, this includes the use of analytic techniques, models, and computer programs to investigate plasma physics of auroral ion beams, relativistic electron precipitation and its effects on the lower D-region, turbulent heating of cold electrons escaping from the ionosphere, upper hybrid turbulence effects, and the spatially inhomogeneous nonlinear saturation of electrostatic whistlers and upper hybrid noise generated by the auroral beam.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0004, MAGNETOSPHERIC PHYSICS

H. Sauer, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab., *Boulder, Colorado* 80302 (8DJ4 04 10)

PROJECT OBJECTIVE: Theoretical and experimental studies are conducted using data primarily from in-house satellite packages aboard both operational and research satellites in an effort to explain magnetospheric dynamic processes, both for their intrinsic scientific value as well as to help determine the ultimate consequences of these processes of importance to man's activities.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab.

5.0005, REMOTE OCEAN SUBSURFACE TEMPERATURE PROFILER (ROSTEP)

V.E. Noble, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN680319)

To determine the feasibility of remotely measuring the open ocean subsurface temperature profiles. These measurements will provide quantitative data which support meteorological and oceanographic prediction models and for sound velocity calculations to predict performance of tactical and strategic acoustics weapons systems. The fundamental problem is to develop a remote sensing capability that measures temperatures below the surface of the ocean.

Utilize the fact that the Raman spectrum centroid shifts with the temperature of the medium, conduct a system analysis for establishing system parameters of a model laser sensor in the visible region for operational measurement of subsurface ocean temperature profiles. Utilize data from field measurements with the feasibility model sensor to define performance parameters for operational systems to meet Navy measurement requirements.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

5.0006, SOLAR CORONAL HOLES AND ENVIRONMENTAL DISTURBANCES AND TECHNIQUES FOR FLARE PREDICTION

R.N. Smartt, U.S. National Science Foundation, *1800 G St. N.W., Washington, District of Columbia* 20550 (DF582000)

AF function - communications, surveillance, detection, tracking. Deficiency - inadequate warnings of sun-induced disruptions of AF communications and detection systems. Objective - assist the air weather service in improving the monitoring and prediction of disturbances and study coronal holes and their relations to the geomagnetic index. How research contributes - enables Air Force monitoring capability in detection and routine observation of coronal emission-line intensities and detection of coronal holes. Emission features and coronal holes which may have possible subsequent geomagnetic effects can be detected several days in advance of the solar surface activity producing these coronal disturbances.

Techniques are to be developed and applied to existing SPO coronal photometer for the added capability of observing two additional coronal emission lines and also increasing the signal-to-noise ratio to allow more efficient detection of coronal holes.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0007, REFURBISH ULTRAVIOLET SPECTROMETERS

C.G. Kuczun, Tri Con Associates Inc., *Cambridge, Massachusetts* (DF580570; F19628-78-C-0043)

AF function - vehicle tracking during flight and reeentry, trajectory prediction, communication systems. Deficiency - present atmospheric models predict only slight variability of the density of the upper atmosphere below 200 km, however, empirical data show this conclusion to be incorrect and observations indicate density changes as great as 50 percent in both space and time at altitudes between 120 and 200 km. This altitude region important for Air Force operations, will be studied on a worldwide basis by density experiments aboard the DMSP satellites. The present work will support these experiments. Objective - in-situ measurements with rockets of atmospheric parameters to provide correlative data for comparison with photometric data from DMSP satellites. How research contributes - provides direct, low altitude measurements of pertinent atmospheric properties as an aid in understanding the remote optical measurements made from DMSP satellites.

Contractor shall refurbish two rocket ultraviolet spectrometers recovered from previous rocket flights and provide field engineering services required to prepare four such spectrometers for future rocket flights. With these rocket payloads measurements will subsequently be made of the photoelectron flux and differential energy distribution for energies between 0 and 100 electron volts, of the radiance of nitrogen airglow at 3371 angstroms and of the density and composition of the upper atmosphere as established by solar ultraviolet photon absorption

rates. All measurements will be made from a single rocket payload in the altitude range between 120 and 200 km.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0008, LINE-OF-SIGHT CLIMATOLOGY

D.D. Grantham, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF581520)

AF function - operation of AF systems using visual or infrared wavelengths for detection or tracking and systems using millimeter-wavelength communications. Deficiency - AF systems designated above have operations which are often inhibited or terminated due to cloud, haze or precipitation interference. Cloud-free line-of-sight (CFLOS) probabilities are needed for AF operational areas. Objective - to determine probabilities of cloud-free and haze-free lines-of-sight from various aircraft altitudes to earth and to space. To develop precipitation-free clear line-of-sight (CLOS) and CFLOS atlases for various regions of the northern hemisphere based on radar observations, aircraft observations, and a statistical model using ground observations of cloud cover. How development contributes - CFLOS probabilities will aid designers and operators in determining the utility of AF systems. The atlases will depict regions where unacceptable risks of failure are expected. The microwave attenuation climatology will provide quantitative information on how often precipitation will affect transmission along millimeter wave ray paths at various elevation angles for differing climatic regions.

A LOS in-flight data collection program is being conducted to gather clear, cloud-free or hazy line-of-sight observations over Europe at altitudes of 10,000 feet and below. These in-flight observations are being made by U.S. Army helicopter squadrons in Europe. These observations, along with those previously collected, will be analyzed to determine clear, cloud-free and haze-free LOS probabilities to the ground, horizon, and sky from various altitudes along flight paths over Europe. A model has been developed which gives CFLOS probabilities through the atmosphere for 10, 20, . . . , 90 degrees elevation angles based on the climatic cloud cover statistics from a given location. The model will be applied to about 1200 stations to produce CFLOS atlases for regions of the northern hemisphere. Three-hourly radar-scope photographs were taken at 17 continuously operating National Weather Service (NWS) storm radar sites in the U.S. National Climatic Center personnel at Asheville, NC have extracted data from these special photographic observations and will prepare them for computer analysis at AFGL. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0009, MAGNETOMETER NETWORK INSTALLATION

D.J. Knecht, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF257180)

AF function - operation of systems for communications, detection, surveillance, guidance, and navigation. Deficiency - performance degrades and becomes unpredictable during severe magnetic activity. False signals may occur. Objective - to expand in FY78 a magnetometer network from five to seven field stations for the collection of terrestrial magnetic activity data to be used for the development of models of the complex earth-ionosphere, magnetosphere-solar wind system and from which magnetic activity levels may be specified in real time. How research contributes - the ability to predict magnetic activity 1-3 hours in advance would enable the command director of NORAD to anticipate critical periods for these systems and exercise his options for alternate methods of surveillance. A capability to predict magnetic activity would minimize SAC missions that are aborted because of communication problems because mission planners could reschedule missions for quiet magnetic periods or modify the communications plan, i.e., change the mode of transmission from HF to line of sight.

Models of the complex earth-ion sphere magnetosphere-solar wind system are needed to specify and predict magnetic activity levels. Construction and verification of these models require a broad data base, and the requirements for specification and prediction make real-time data collection necessary. Seven data-collection stations for measuring magnetic activity have been installed along two lines of constant geomagnetic latitude. The digital data from each site are being transmitted on phone lines to a computer-controlled data-acquisition station at AFGL. The basic system was completed in FY77, and a series of equipment modifications will be undertaken to improve data quality and reliability on the basis of the data obtained during the twelve months of FY77. A number of hardware and software additions will be made to bring the operation of the network and the diagnosis of system malfunctions under the automatic control of the existing computer. The data-processing software will be augmented to provide on a routine basis data presentations which are increasingly informative and useful. These, along with the archived original data will be provided for the development of magnetic-activity models in three areas, (a) the solar wind, its interaction with the magnetosphere and as a triggering mechanism. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0010, ANALYSIS OF ATMOSPHERE EXPLORER AND S3-1 DATA

F.A. Marcos, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF581210)

AF function - airborne surveillance, target acquisition. Deficiency or opportunity - atmospheric density variations with time and space cannot be accurately predicted. Objective - to analyze density results from the AE/S3 accelerometer data base and to relate them to coordinated measurements of composition and other structure properties for the development of an improved atmospheric model. How research contributes - an improved empirical density model will be developed for the altitude region 140-250 km. More accurate density models permit improved surveillance capability and will result in less frequent recalculations by ADCOM of the orbital elements of satellites resulting in a considerable savings in computer costs and improved operational capability.

The accelerometer density data base will be expanded to include all available AE-C, -D, -E and S3-1 data. Correlative composition and temperature data will also be included where available. Studies will be made to determine properties of atmospheric variability related to (a) longitude (b) geomagnetic activity and (c) local time. These results will be used to complement and extend the preliminary model developed using AE-C data.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0011, INVESTIGATION OF 15 MICRON SATELLITE DISCREPANCY

R.A. McClatchey, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580300)

AF function - weather forecasting, weapons delivery, surveillance. Deficiency - inability to adequately utilize satellite radiances in remote sounding of temperature and moisture. Objective - investigate sources of uncertainty in the calculation of radiances in the 15 micron carbon dioxide band. How research contributes - improves the ability to analyze and forecast atmospheric parameters of importance to military operations, particularly over data-sparse or data-denied areas.

Laboratory measurements of the 15 micron carbon dioxide transmittance will be analyzed with the object of establishing a more accurate transmittance calculation technique in this spectral region. Modified transmittances will be used to revise radiance calculations for comparison with satellite measurements. An experimental program will be carried out to study the relationship between radiometric temperature measurements and radiosonde data as a potential source of discrepancy between satellite measurements and ground truth calculations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0012, SPACECRAFT SHEATH MODEL 1

A.G. Rubin, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF249040)

AF function - AF satellite systems operate at synchronous altitudes where charging can occur due to natural causes and may give rise to effects deleterious to the systems. Deficiency - the plasma physics interactions responsible for spacecraft charging are not well understood at present and it is necessary to develop appropriate models in order to obtain this understanding. Objective - to develop descriptions of the plasma and energetic particle environment surrounding a spacecraft at high altitude and its spatial and temporal behavior. How research contributes - numerical simulation of plasmas techniques are employed to model the plasma physics interactions of the ambient environment with the spacecraft. Understanding of the interaction and the ability to model sheaths, beams, secondary effects and instabilities will contribute vitally to the solution of the spacecraft charging problem.

A spherically symmetric code has been developed employing a numerical simulation model. The motion of several thousand particles in the field of the spacecraft and their self-consistent field is followed. The code includes the quiet start technique, cloud in cell particle treatment, and distribution function smoothing. Photosheath effects are treated, as well as secondary electrons and electron and ion guns. Quantities calculated are the satellite potential, the sheath structure and the current to the satellite.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0013, RESEARCH IN ATMOSPHERIC SCIENCES/PHYSICS AND CHEMISTRY OF THE MIDDLE ATMOSPHERE/MEASUREMENTS OF ATMOSPHERIC REACTIONS

M.G. Heaps, U.S. Dept. of Defense, Army, Electronics Command, Atmospheric Sciences Lab., *White Sands M.R., Las Cruces, New Mexico* 88002 (DA0D2298)

Determine and/or measure photodestruction cross sections, reaction rate coefficients and other atomic and molecular properties which occur in the upper atmosphere under conditions of normal diurnal variations, naturally occurring atmospheric disturbances, or nuclearly disturbed atmospheres. The principal ions to be studied are important in atmospheric ionization/deionization processes. The specific reactions to be measured are determined in other work units. Section 9 of the Army qualitative research requirements for nuclear weapons effects information documents the requirements for this work in connection with Army communications and ballistic missile defense.

High-power continuous wave and dye lasers are used to photodissociate ions in a drift-tube, mass spectrometer facility. The data are used to determine ion photo-dissociation and photodestruction cross sections, ion mobilities and reaction rates.

SUPPORTED BY U.S. Dept. of Defense, Electronics Command, Atmospheric Sciences Lab.

5.0014, STUDY DEVELOPMENT OF AN OBJECTIVE METHODOLOGY FOR DETERMINING STRATOSPHERIC-TROPOSPHERIC MASS EXCHANGE

Unknown, Oregon State Higher Education System, Oregon State University, Graduate School, *100 Benton Hall, Corvallis, Oregon* 97331 (FA77WA-3992; FA160416 (TRAIS NO.))

Develop, test and document an objective methodology for the quantitative determination of the amount of air exchanged between the stratosphere and the troposphere. Such determination shall include the mean values and the variabilities of the mass exchange rates as functions of altitude, latitude, longitude, season and year.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

5.0015, AN INITIAL FEASIBILITY STUDY TO ESTABLISH A VERY HIGH LATITUDE INCOHERENT SCATTER STATION

P.M. Banks, Utah Higher Education System, Utah State University, School of Science, Dept. of Physics, *Main Bldg., Office 104, Logan, Utah* 84321 (ATM7826533)

The major thrust of the field of upper atmospheric physics in the 1980's will be in the area of atmospheric dynamics, particularly as affected by energy inputs at high latitudes. An important region of the upper atmosphere about which we know very little is the high latitude 'cleft region', to which solar plasma has direct access. We do know that energy deposition rates there are over ten times those at lower latitudes. There has been a rapidly growing awareness in the field that an incoherent scatter radar diagnostic capability is needed by the field to advance understanding of this region.

Recommendations that such a diagnostic capability be established have been progressively reaching more formal levels, with increasingly broad support by general statesmen of the field, the most recent of which was in October of 1978, when the Committee on Solar Terrestrial Relations approved such a recommendation.

This grant funds a quantitative study of the fruits, technical constraints and costs of such a project, a necessary input to further serious consideration of action on such a project. Specifically this initial feasibility study will examine and document the scientific return from establishing a radar in the vicinity of the cleft (70 degrees-78 degrees Magnetic latitude), and will determine the optimum location for such a station from a scientific and logistics standpoint. The possible options for establishing such a station and their costs will be evaluated, and recommendations will be made on the timing and means of carrying out the project.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0016, EXTRATROPICAL CYCLONIC STORMS - THE CYCLES PROJECT

P.V. Hobbs, University of Washington, School of Arts & Sciences, Dept. of Atmospheric Science, *Seattle, Washington* 98105 (DF047280; F49620-77-C-0057)

AF function - the minutemen and ABRES programs require hydrometer information. The AWS also requires droplet information to parameterize energy and water budgets in numerical weather prediction. Deficiency -rainfall statistics, droplet sizes and spatial distribution. Objective -the focus of effort will be narrowed during FY79, 80. The principal effort will be to measure drop and crystal sizes within the six different types of mesoscale rainbands within cyclonic storms. The microphysics will be interpreted in terms of associated meso and synoptic scale observations. Contribution - provide hydrometer size, number density climatologies for Pacific storms. This, plus the AFGL measurements over Kwajalein Is. and the U.S. will provide both system design criteria for missile nose cones and helicopter rotors, and data for laser and microwave attenuation studies.

Either an Electra or a P-3 aircraft will replace the present aircraft to permit aircraft penetrations into areas of heavy icing. The replacement aircraft and the Univ. of Washington's B-23 will carry full arrays of 1-D and 2-D particle measurement systems to acquire data on hydrometers as part of NSF field programs to investigate large cloud systems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

5.0017, STUDIES OF HIGH PLAINS CONVECTIVE CLOUDS

G. Vali, University of Wyoming, School of Engineering, Dept. of Atmospheric Science, *P.O. Box 3435, University Station, Laramie, Wyoming* 82070 (ATM78-05745)

The purpose of this project is to carry out cooperative field studies in three major aspects of the convective cloud research project (CSP) which will be conducted by the Convective Storms Division of NCAR during the summer of 1978. This research, conducted by the University of Wyoming emphasizes: 1. Aircraft measurements of storm clouds. 2. Subsequent analysis of the data collected during the field project. 3. A special critical comparison study of the various aircraft liquid water probe measurements.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0018, SOLAR EFFECTS ON WEATHER
R. Reiter, Physikalisch Bioklimatische Forchungsstelle, *Garmisch Partenkirchen, Federal Republic of Germany* (DN875340; N00014-77-G-0028)

The objective of this research is to determine to what extent certain established solar terrestrial relationships affect the quality of the weather forecast. Improvement of the weather forecast for naval operations is the naval relevance.

To make this determination, the contractor has available a ten year file of statistical data on the concentration of certain radio nuclides, ozone, and fall out from which he can detect the occasions when there was an infusion of stratospheric air into the troposphere after a solar event.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0019, NAVY ENVIRONMENT - CLOUD PHYSICS
J. Latham, University of Manchester, Inst. of Science & Technology, *Sackville St. 1 Lancs, Manchester, England, United Kingdom* (DN475237; N00014-77-G-0027)

The objective of this research is to study the evolution of the drop size spectrum of both a cumulus and a stratus cloud. The naval application will be to better modelling of light transmission through clouds in support of electrooptic systems and improved visibility forecasts.

This research will be conducted initially in the laboratory in preparation for one of the initial flights aboard the space shuttle. The preparation will require some modification of the University of Missouri design chamber (ONR contract N00014-75-C-0182) to include air jets to simulate cloud entrainment of drier air. The continuous measurement of the drop spectrum in the space chamber will probably be by a disdrometer being developed under ONR contract N00014-76-C-0436 with the University of Missouri.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, MOLECULAR SIEVE OXYGEN GENERATION SYSTEM
J. Ruder, Garrett Corp., *402 S. 36th St., Phoenix, Arizona* 85034 (DF323150; F33615-77-C-0620)

This effort will develop a breadboard breathing gas generation system based on molecular sieve concentration of ambient air. The system shall be used for test and evaluation of on-board oxygen generation concepts for USAF aircraft. The system should be a lightweight, easily serviced assembly capable of providing a continuous supply of an appropriately oxygenated breathing gas mixture for one man in an aircraft cabin environment. Engine bleed air or its laboratory equivalent will serve as the input air. The system shall be used primarily to investigate the effect of contaminated bleed air on unit performance.

The molecular sieve oxygen generation system (MSOG) should be capable of producing a 90 percent or higher oxygen enriched effluent over a delivery range of 5-50 liters per minute. The MSOG should be capable of operating with an input pressure and input temperature ranging from 5-200 PSIA and 70-300 degrees Fahrenheit, respectively. The MSOG must have a variable cycle time capability for the adsorbent bed(s). Access panels to the adsorbent bed(s) are required for gas analysis on both the input and output sides of the bed(s). Normal operation should require a maximum of 100 watts power utilizing either 28 VDC or 110 VAC, 60 Hz.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0002, SIMULATOR FOR AIR-TO-AIR COMBAT SYSTEM RESPONSE
W.J. Hopkins, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF223400)

To document the performance of the simulator for air-to-air combat's six-degree-of-freedom motion system and to investigate and describe the motion platform drive algorithms and hardware.

Accelerometers will be affixed to the motion platform. Specified sinusoidal and step inputs will replace selected pilot control inputs to determine flight equation and motion system frequency response amount of lag and to assess motion system fidelity during selected maneuvers. The results of this work will provide the basis for software/hardware modifications to the motion system to improve training. They will aid in the interpretation of training effectiveness studies and motion system evaluations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0003, DETERMINATION OF PHYSIOLOGICAL RESPONSES OF PARACHUTISTS TO THE AEROSPACE RECOVERY ENVIRONMENT
D.W. Call, U.S. Dept. of Defense, Navy, National Parachute Test Range, *El Centro, California* 92243 (DN032001)

To acquire physiological and force data from parachutists continuously throughout parachuting operations; to correlate biomedical and engineering parameters; to use present technology to solve specific fleet problems with personnel recovery systems; to support the scientific design, development and testing of future life support systems to enable better human engineering; to investigate basic human response to dynamic environments; to reduce emergency escape and recovery injuries.

Parachutist-borne multi-channel FM/FM telemetry systems are primary data acquisition systems and have been described. Single channel tape recorder ECG units are backup and for Salton Sea and cockpit use. Parameters measured include: ECG (rate and rhythm), respiratory rate, riser forces, triaxial accelerations, EOG event marker, body temperature, and voice.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Medical Research & Development Command

6.0004, DYNAMIC RESPONSE OF VERTEBRAL ELEMENTS RELATED TO USAF INJURY
J.F. Lafferty, University of Kentucky, School of Engineering, Dept. of Mechanical Engineering, *Limestone & Euclid, Lexington, Kentucky* 40506 (DF046790; AFOSR-78-3488)

AF function - effective ejection of aircrew members from high-speed aircraft requires the maximum acceleration allowable within human tolerance. This implies the optimal combination of restraint and orientation, seat configuration and acceleration profile. Deficiency -past observations indicate that most of the irreversible damage sustained during ejection is related to the vertebral column. Knowledge of the dynamic material properties of the spinal elements is limited. Objective - this research will determine the load distribution and stress-strain characteristics of the vertebral joints at normal and at right angles to the spinal axis. How research contributes - the tests proposed are unique and will integrate with the AMRL program dealing with vertebral unit strength and interspecies scaling relationships. Results will provide previously unavailable data on spinal column strength. This research is identified in subarea 1.6, 'Aircrew Safety and Effectiveness in Mechanical Force Environments.'

Stress-strain characteristics will be determined as a function of strain-rate for shear, bending, torsion and tension.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0005, GANGLION CELL RESPONSES FOLLOWING LASER EXPOSURE OF THE RETINA
M.L. Wolbarsht, Duke University, School of Medicine, Dept. of Ophthalmology, *Box 3711, Durham, North Carolina* 27706 (DF319770; F33615-77-C-0609)

To determine the extent of retinal area disrupted by lesion-producing laser exposures and correlate this with the time course of retinal function loss and recovery at energy levels less than those producing permanent lesion.

The use of the electrophysiological technique of recording from retinal ganglion cells will be made to evaluate laser exposure effects in the retina.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0006, AIRCRAFT PERSONNEL RESTRAINT SYSTEMS IMPACT DYNAMICS

J.W. Brinkley, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF320450)

Current military personnel restraint system specifications require tests to determine only ultimate static breaking strength of restraint webbing material to evaluate the adequacy of restraint systems during impact. Since restraint materials are sensitive to strain rate and the dynamic response of the human body amplifies impact loads, existing static test requirements are inadequate to insure crew protection during emergency escape or aircraft crash. Recent AFSC IG findings cite unresolved technical controversy regarding the affect of webbing properties on crew protection. The objectives of this research are to (1) determine the influence of the mechanical properties of restraint systems during impact, (2) provide biodynamic data for restraint design and dynamic test criteria and (3) acquire data for a computer model of the human body and restraint components to predict crew responses to impact environments.

The kinematic and inertial responses of volunteer subjects will be measured in a series of minus g x impact tests with three acceleration levels and three restraint harnesses. Static and dynamic tests of the restraint webbing will determine their mechanical properties. The stiffness of the harnesses will vary from 500 to 12,000 lbs/in. Human kinetic and kinematic responses will be predicted using a mathematical analog, the articulated total body model.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0007, TOXIC HAZARDS RATING OF AIR FORCE NON-METALLIC MATERIALS

D.L. Geiger, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF323780)

To determine the physical and chemical behavior of AF nonmetallic materials, plastic waste and surplus organic compounds under a variety of conditions to ascertain their potential toxicity (when utilized in confined habitable spaces), and to identify the environmental pollution impact from their disposal by incineration. To establish thermal profiles for safe utilization of synthetic polymers in confined, habitable spaces. To identify and quantitate thermal degradation products under pyrolytic and oxidative conditions, and to investigate kinetic parameters for thermal decomposition reactions of nonmetallic materials. To determine the toxicological impact of nonflammable fibrous materials used in Air Force aeronautical systems, during routine service conditions and in emergency crash situations. To perform toxic hazard evaluation of these data as they relate to operational exposure of AF personnel and/or environmental impact of use and disposal of such materials. This work is requested by AFSC laboratories, ASD, SAMSO, and AFLC.

Thermogravimetry is used to study physical and chemical stability as well as thermal degradation reaction rates of AF nonmetallic materials. Various heating rates and sample environments are employed. For quantitative determination and identification of individual thermal breakdown products, combinations of the simultaneously performed analytical techniques of thermogravimetry (TG), gas chromatography (GC), and mass spectrometry (MS) (TG/MS, TG/GC/MS) are employed. Pyrolysis studies allowing very fast heating rates are carried out also in combination with gas chromatography and mass spectrometry to supplement degradation data. Additional analytical methods such as direct probe mass spectrometry, cryogenic trapping and infrared spectrometry are used as deemed necessary.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0008, WEAPON DELIVERY INTERFACES FOR ADVANCED FIGHTER AIRCRAFT

P.V. Kulwicki, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF321140)

Develop human engineering criteria for improved weapon delivery from advanced technology aircraft. During FY 77, the specific objectives are: (1) identify key weapon delivery interfaces (control/display concepts, presentation formats, event timing, etc.) contemplated for advanced technology aircraft and determine the adequacy of existing criteria for crew integration and (2) describe the nature of weapon delivery opportunities associated with the use of advanced technology air-to-air missiles. The need for this effort arises from the following factors: (1) recent trends in aircraft design toward greater maneuverability have led to more fleeting air-to-air weapon opportunities resulting from a much lower frequency of conventional tailchase situations, (2) increased cost of azmament demands higher success per round expended, (3) the need to penetrate heavy defenses argues for a single pass strike ability, (4) attack missions at night and in marginal weather require high crew workload, and (5) the level of automation needed for weapon delivery from advanced technology aircraft has not been established. Inasmuch as crew effectiveness is paramount for weapon delivery, improved human engineering criteria will directly support the AFSC development goals TC-2, TC-5, and MS-4 as well as ASD TN 72-46 (high acceleration cockpit) and the draft requirement TAF-301-73 (advanced tactical fighter).

The major FY 77 objectives will be satisfied by (1) the acquisition and review of tactical planning documents, mission analyses, technology studies and configuration studies with emphasis on a 1982 technology state-of-the-art for tactical weapon delivery, the product of this effort will be an informal analyses report (annually revised) which will document projected mission trends and identify gaps in the availability of interface criteria to aid in planning further developments, and (2) a detailed analysis of an existing data base of simulated air combat wherein advanced missiles were used in a broad spectrum of man-in-the-loop tests from a variety of advanced technology aircraft.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0009, PERFORMANCE LIMITS OF EAR INSERT COMMUNICATIONS

R.L. McKinley, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF321350)

Air and ground crew voice communications are degraded by high level environments that exceed the performance limits of present standard communication equipment creating command and control problems and safety hazards in routine as well as emergency situations. The objective of this effort is to establish the communication and protection performance limits in high-intensity noise environments of the ear insert communications concept. This effort will benefit asd life support SPO and ground crew effectiveness and safety by identifying noise exposure envelopes within which the ear insert communications concept will provide adequate hearing protection and satisfactory voice communication.

The approach incorporates the laboratory simulation of specific aircraft noise environments, the progressive evaluation of ear insert units at increasingly intense levels of these environments by measurement of hearing protection characteristics and then communication effectiveness. A hearing protection/voice communication envelope of the performance limits will be developed based on these data for both monaural and binaural configurations of the ear insert receiver and compared to the performance of current standard items.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0010, IMAGE DISPLAY METRICIZATION
H.L. Task, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF320970)

The objective of this work unit is to develop, refine and validate display measures and techniques which are relatable to observer performance. This includes cathode ray tube (CRT) displays, liquid crystal displays and light emitting diode displays used for imagery or symbology purposes.

The image metric laboratory will be utilized to investigate various display measuring procedures. Initial effort will center on CRT displays utilizing imagery producing sources. Later efforts will extend these mensuration techniques to symbology displays and solid-state display devices, i.e., light-emitting diode arrays, liquid crystal matrix displays, etc. The overall capability of the image metrics laboratory will be developed to allow a systematic trade-off of candidate photometric/radiometric mensuration techniques based upon reliability, repeatability and appropriateness of each measure for describing display image quality. Candidate measurement techniques will then be evaluated utilizing psychophysical and electro-physiological studies to ascertain the value of the approach for correlating with operator performance. A specific on-going effort will continue to evolve a unity image quality metric based upon description of the interaction of human visual modulation threshold function and the measured modulation transfer function capabilities of the display device. A product of this work unit therefore will consist of validated standardized techniques for a sessing imaging display performance which can be used to establish a MIL STD for imaging displays. In addition, the outxut of this effort is essential for establishing the overall unitary/image quality metric described in RTE-B5 work unit B-Display/Operator Interface and Target Acquisition Prediction Model in RTE-D1 work unit B. This work unit supports AFSC development goals TC-1, TC-7, C3-3 and MS-4. This work unit replaces work unit 71841101, Image/Display Quantification.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0011, HEAD IMPACT PROTECTION CRITERIA FOR BIRD-PROOF AIRCRAFT CANOPIES
N.S. Phillips, University of Dayton, School of Engineering, Dept. of Civil Engin, *300 College Park Ave., Dayton, Ohio* 45469 (DF320650; F33615-77-C-0534)

Objectives are: (1) provide methods to assess biomedical effects of direct impact of crewman's helmeted head, (2) determine the influence of the USAF flight helmet on impact transmitted to head, (3) determine head impact measuring techniques and (4) develop method to simulate the crewman during bird impact tests of aircraft canopies. The ultimate goal is impact test and evaluation criteria for new aircraft windshields/canopies and flight helmets.

Canopy impact data from tests of F-16 and F-111 canopies will be analyzed, existing analytical models of aircraft canopy impact responses will be applied, the importance of crew position during impact will be evaluated. Analogs of the crewman's impact response and helmet dynamics will be used to assess canopy impact environments and they will be refined for aircraft canopy design evaluation applications, and impact tests of helmets will be done to determine their protection properties. Standards for aircraft canopy test and evaluation criteria will be developed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0012, AIRCREW PERSONNEL PROTECTION, ESCAPE AND SURVIVAL SYSTEMS
D. Desimone, U.S. Dept. of Defense, Navy, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate, *Warminster, Pennsylvania* 18974 (DN833230)

To provide naval aircrew personnel with the operational capability to perform aircrew tasks with maximum efficiency. To neutralize the effects of in-flight stresses, and to provide for escape survival and rescue following loss of the aircraft. The following elements support this effort in addition to those listed in item 10 above: P.E. 62241N, P.N. F41-451, P.E. 63216N, P.N. W0583000 and W058-001, P.E. 60000N, P.N. WR68E89, and 510000002, P.E. 63203N, P.N. WSL-08.

The NavAirDevCen will provide the technical management of the full life cycle of aircrew personnel protection escape and survival systems. The management will include the various phases of RDT&E, acquisition, production, deployment and ILS. Programs will be reviewed, monitored and funded as needed to maintain a continuing flow of progress and milestone achievement. Work is also being performed on contract as reported in various work units.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

6.0013, OPERATION AND MAINTENANCE OF USAFSAM CENTRIFUGE, PATHOPHYSIOLOGY OF PLUS GZ
R.W. Thompson, Technology Inc., *8531 N. New Braunfalo Ave., San Antonio, Texas* 78217 (DF324050; F33615-78-C-0618)

This effort has several objectives including (a) operation and maintenance of the USAFSAM human centrifuge, (b) test g sensitivity of selected items of life support/electronic physiological sensor equipment, (c) evaluate pathology in primates that may result from repetitive, chronic plus GZ exposure, (d) develop a methematical model that may predict pathophysiologic response to plus gz stress, (e) program and test an AF manikin for simulation of human response to environmental stress.

Using the USAFSAM centrifuge, an animal analog of man will be examined during and following repetitively imposed plus gz stress over periods as long as 6 months. The principal approach will be the investigation of pathology that may result in critical organ systems or the adaptation that may occur. Again using the human centrifuge as a test bed, items used to monitor physiological function will be evaluated for g sensitivity.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0014, MATH MODELS IN S/V ANALYSIS
J.A. Bachman, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF315760)

Operations personnel, strategic/tactical planners, weapons analysts and system designers need to be able to accurately predict the impact weapons radiation has upon aircrew performance and subsequent mission success. Our objective is to develop, refine, verify and exercise mathematical models of operator-machine interaction and experimental animal to man extrapolations for purpose of S/V analysis of manned AF operational systems, to conduct in-house and contractual research in the definition and measurement of model input parameters, to perform mathematical and statistical analyses of the precision and accuracy of model output, to utilize resultant models in meeting requirements posed by using commands, weapons analysts and system project offices.

The development of a model of the manned aircraft in a nuclear environment considers the aircraft aerodynamic and control characteristics, atmospheric turbulence, terrain (for low level flight), interaction with other aircraft (for refueling), human performance capability under such stressors as fatigue, task complexity, vibration, and ionizing radiation, and scenario dependent factors such as mission duration, workload, and nuclear threats. The model is expected to be relatively complex and in the form of a user-oriented computer code. It would have a high degree of flexibility and could provide estimates of the probability of mission completion for many and various combinations of human and/or system performance degradation, adverse weather conditions, equipment failures and threats encounted.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0015, DEVELOPMENT OF AN ADVANCED OPERATIONAL ANTI-G VALVE
R.R. Burton, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF322320)

To design, fabricate and test experimental anti-g valves which will improve g-protection during exposure to aerial combat

maneuvers. Anti-g valves developed in-house and through contract will be tested for improved g-protection using standard USAF anti-g suits. Anti-g valves found superior to the operational USAF anti-g valve will be documented and their specifications will be transferred to ASD/AEL.

Various experimental anti-g valves will be tested on human subjects exposed to various g profiles using g onset rates up to 6 g/sec. Criteria for evaluating suit inflation will be considered relative to g onset, several physiologic parameters, and subjective evaluation. These results will be compared with those obtained using the standard USAF anti-g valve. Specifications of valves with superior operational characteristics will be handed off to ASD/AEL.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0016, USAFSAM CARDIOVASCULAR DISEASE FOLLOW-UP STUDY CLINICAL EVALUATION

R.S. Dryden, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF323070)

Provide clinical evaluation in standardized environment to identify the earliest signs of occult or latent coronary artery disease and relate these to the 20 plus years of risk factor data which have been accumulated on this selected population. This information would be assimilated into refined selection and retention criteria for officer candidates in order to select and retain those least likely to suffer from premature cardiovascular disease.

Perform a thorough examination at USAFSAM to evaluate each subject's cardiovascular system and all risk factors, including all applicable medical and laboratory tests. Devote special attention to motivating subjects, both active and inactive, to participate in the study. Collate the data obtained from multivariate analysis of risk factors. Apply the results to the problems of (a) improved selection of candidates for pilot training and (b) early identification of individuals prone to heart disease. This work was previously documented under work units 7930-07-05 and 7755-14-04.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0017, INFLIGHT EVALUATION OF COCKPIT THERMAL ENVIRONMENT

J.T. Merrifield, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF322670)

Air force operations expose personnel to a wide variety of thermally stressful conditions both inflight and on the ground. Accurate measurement of field conditions are necessary to provide a data base to determine the adequacy of environmental control systems and individual thermal stress protective garments. Previous accomplishments in this area are documented under work unit 7164-17-23. This work unit is being established to implement a new technology objective as directed by HQ Aerospace Medical Division. Application of data base obtained from this work unit is being performed under work unit 7930-12-04.

Unique, USAFSAM developed instrumentation will be used to record dry bulb temperature, dew point, air flow, black globe temperature, heart rate, body core and multiple skin temperatures. Inflight data will be obtained from experimental aircraft stationed at Edwards AFB and operation aircraft located in thermally stressful areas of the United States.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0018, VALIDATION OF PERSONALITY INVENTORY TESTS FOR IMMEDIATE RISK FUNCTION OF AIRCREW MEMBERS WITH POTENTIAL CARDIOVASCULAR DISEASE

M. Thomas, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF321900)

This effort is part of an overall immediate risk function evaluation of aircrew members to identify those at high risk for a coronary event. The predictability of personality inventory tests will be defined and correlated with the immediate risk function probability of other risk factors. As a result of this work, a test will be defined for use in the general flyer population.

Personality inventory tests will be given to aircrew members who will be classified according to various personality types. The results will be correlated with the presence or absence of risk factors, clinical evaluations including coronary arteriography, and stress testing. This work was formerly documented under 7755-01-05.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0019, EVALUATION OF HARMONIC ACCELERATION AS A DIAGNOSTIC TEST OF VESTIBULAR FUNCTION

J.W. Wolfe, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF321650)

This effort is concerned with the delineation of parameters of harmonic (sinusoidal) angular acceleration which will aid in the diagnosis of peripheral and/or central vestibulo-oculomotor pathology in aircrew members.

Using modern analog and digital techniques, nystagmic (eye movement) data will be collected from both animal and human subjects during harmonic stimulation. These data will be analyzed for phase shift and slow phase symmetry. This study is a continuation of work formerly documented under work unit 7755-08-14.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0020, AUTOMATED PATIENT RECORD SYSTEM

M.E. Womble, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF322080)

To determine the feasibility of incorporating the USAFSAM central waiver repository file into a system capable of giving medical personnel in the surgeon general's office instantaneous access to the file on a 24-hour basis.

The waiver file will be brought up under a data base management system capable of automatically receiving requests and corrections, sorting files, and transmitting desired records. Concurrently, an intelligent terminal will be designed which will automatically communicate with the data base management system. The terminal will be installed in the Surgeon General's office and the entire system evaluated with different transmission media (direct line, WATS, AUTOVON).

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, SOFTWARE PARTITIONING SCHEMES FOR ADVANCED SIMULATION COMPUTER SYSTEMS

A. Steinmetz, Teledyne Brown Engineering Co. Inc., *Cummings Research Park, Huntsville, Alabama* 35807 (DF228570; F33615-78-C-0013)

To develop design concepts for a technique, tailed to flight simulation problems, that will automatically divide a large software system into tasks that can be executed in parallel on multiple processor systems. The work will result in a set of guidelines for an automatic software partitioning scheme that can also identify interdependencies and communication links between tasks and determine methods of execution to prevent system deadlocks.

A complete simulator analysis will be conducted to determine the design goals and input/output parameters for a software

partitioning technique. This includes an analysis of the hardware and software aspects of real-time flight training simulators to identify the factors which influence how the software should be partitioned. The basis for the software analysis will be a benchmark simulation problem to be supplied by the Air Force. The hardware analysis will be based on conceivable computer and peripheral configurations for simulation to be identified by the contractor. Using this data, a set of design goals will be developed for a software partitioning technique. The input and output parameters necessary for this technique to achieve the design goals will be developed. The design of the software partitioning technique will then be developed to the point that it is automated to the maximum extent possible and can be demonstrated by hand. Simulator analysis, 8 MAC, develop model parameters, 10 MAC, algorithm development, 15 MAC, contract end, 18 MAC.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

7.0002, FLIGHT CONTROL COMPUTER

W.F. Otto, U.S. Dept. of Defense, Army, Missile Research & Development Command, High Energy Laser & Research Lab., *Redstone Arsenal, Huntsville, Alabama* 35809 (DA0F1006)

77 06-77 09 - the accuracy of a free rocket is to be significantly improved by adding a minimal amount of on board control devices and no gyros.

77 06-77 09 - a ground mounted laser radar will track a retro-reflector on the rocket. The laser data will be altered and compared to a reference trajector in real time and impact position is estimated. Any corrections are made by sending coded laser pulses to the rocket to fire side thrustors. The necessary roll position of the rocket is measured by the polarization of the signal return from the corner reflector. A general purpose computer (HP 2100) is used to provide flexibility and low cost. The reference trajectory is pre-computed and stored on mag tape. A 6940 multiprogrammer interfaces the laser tracker to the computer where Kalman filtering techniques smooth the data. Digital flight data is recorded on mag tape for post flight analysis. The filtered radar coordinates (3) and rates are used for impact estimation. The computer monitors the roll position of the rocket to fire the side thrustors at the correct instant. The demonstration rocket is the Little-john and 16 side thrustors are used.

SUPPORTED BY U.S. Dept. of Defense, Missile Research & Development Command, Technology Lab.

7.0003, MATRIX METHODS FOR SPECIAL FUNCTIONS ARISING IN APPLICATIONS

Y. Ikebe, Northwestern University, Evanston Campus, Technological Inst., Dept. of Computer Science, *633 Clark St., Evanston, Illinois* 60201 (DF046590; AFOSR-77-3183)

AF function - design of structures for aerospace vehicles. Opportunity - the use of matrix-theoretic techniques for the numerical computation of certain quantities associated with vibration and stability problems have not been exploited. Objective - this research intends to convert problems of computation of zeros of functions and eigenvalues of equations into problems in matrix theory which are solvable using readily available computer subroutines. How work contributes - the computation of zeros of functions will become more efficient and reliable.

Algorithms for computing the characteristic values of Mathieu's equation, the zeros of the regular Coulomb wave function and their derivatives will be constructed. A detailed investigation of the nature of the complex zeros of the Bessel functions will be made. An investigation of computational methods for the Eigenvalue problems associated with the spheroidal wave equation and lame equation will be pursued. Emphasis will be placed on the computational aspects of this analysis.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0004, DEVELOPMENT OF NUMERICAL TECHNIQUES FOR PREDICTING AERODYNAMIC HEATING TO FLIGHT VEHICLES

A.B. Lewis, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF135950)

At speeds above Mach 3.5 aerodynamic heating is a design constraint for both aircraft and missiles. Definition of the heating environment is necessary for the design of thermal protection systems and the vehicle structure. Hence, poor definition of the thermal environment will result in improper selection of material and structure which can increase acquisition cost and degrade vehicle performance. This effort has as its objective the development of an analysis technique to predict the aerodynamic heating to vehicles of arbitrary geometry. This will improve the ability to determine the heating levels and to perform trades which can reduce acquisition cost.

Several programs designed to predict pressure distributions, boundary layer behavior and heat transfer rates are being examined to meet weaknesses found in the deJarnette and hypersonic arbitrary body codes. Codes which show a capability to improve on current prediction techniques will be modified to do only the type of calculation required and to make the input compatible with existing programs.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

7.0005, A WALSH FUNCTION APPROACH TO THE ESTIMATION PROBLEM 14483-M

C.F. Chen, University of Houston, School of Engineering, Dept. of Electrical Engin, *3801 Cullen Blvd., Houston, Texas* 77004 (DA0F9044; DAAG29 77 G0143)

The ultimate goal of this investigation is to develop a simple on-line algorithm for estimation of dynamic response of flight vehicles encountering constant disturbance. Relevance - the research is directly relevant to trajectory estimation problems for missiles and other flight aircrafts. The successful completion of this research will benefit MIRADCOM and WSMR in considerable reduction of time and money in their flight test-programs.

The ultimate goal of this investigation is to develop a simple on-line algorithm for estimation of dynamic response of flight vehicles encountering constant disturbance.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

7.0006, NUMERICAL METHODS FOR TIME-DEPENDENT ASPECTS OF HIGH-SPEED AERODYNAMICS

S. Abarbanel, Tel Aviv University, *155 Herzl St., Tel Aviv, Israel* (DF044530; AFOSR-76-3035)

AF function - aerospace vehicles. Opportunity - efficient numerical methods are well along for solving the compressible inviscid time-dependent Euler equations which govern the flow outside boundary layers. There is a need for efficient algorithms which take into account not only effects of the compressibility of the medium but of viscosity as well. The applications of such a development are immediately relevant to Air Force needs, for example, new generations of an air-to-air missile which will be highly maneuverable and will encounter high angles of attack even at high speeds. The aerodynamic characteristics of such slender blunted axisymmetric bodies are highly dependent on viscous phenomena. Complete numerical predictions of such configurations are beyond the current state-of-the-art. Objective - to improve the present state-of-the-art of numerical predictions of real flows through development of efficient algorithms (comparable to those previously developed for the time dependent euler equations which are hyperbolic) for parabolic partial differential equations such as the time-dependent Navier-Stokes equations. A promising step in this direction has already been taken under previous support of this effort. How work contributes -economics alone dictates that design for sustained high-speed flight must be reduced to an accurate engineering procedure. This is not now possible, especially in the case of highly accelerating bodies with non-horizontal flight trajectories in high speed flight. Development of rapid and reliable methods of computing viscous compressible flows through resolution of the conceptual

problems of concern to this effort will do much to bolster engineering confidence in numerical analysis, thereby giving the engineer an added and vital tool for use in efficiently and economically predicting complex flow field interactions.

For equal spatial meshes the number of time steps required for stable numerical solution is much larger for the viscous case than for potential flows. This effort is an attempt to develop explicit finite-difference algorithms for parabolic partial differential equations (the Navier-Stokes equations) that circumvent this difficulty by exploiting such concepts as a generalized Dufort-Frankel method.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, COMPUTER MODELS OF FUSION PLASMAS

O. Buneman, Stanford University, Stanford Electronics Lab., *Stanford, California* 94305 (AT(04-3)-326)

Our energy related work concerns itself with the problems associated with the fusion energy program. It is funded by two agencies, ERDA-DCTR and NSF. Each will be summarized separately. The ERDA work historically has been focused on the conception and development of computational simulation codes which model plasma behavior. We have most recently brought up a three-dimensional relativistic, E-M, particle code which has demonstrated the feasibility of full three-dimensional treatments using existing computers (rather than next generation machines). This code has already yielded important new results in the areas of current carrying plasma column stability, anomalous DC resistivity and current filamentation, and interaction of a plasma slab with an intense E-M field. Our current thrust is in support of the mirror confinement effort. We are treating the problem of neutral injection and field reversal in magnetic mirrors. Preliminary results indicate that only field reduction, not field reversal, can be achieved, owing to a flute instability which is electrostatic in nature. This might explain similar experimental results. (The NSF sponsored work is concerned with a computational search for stable one-dimensionally confined plasma configurations. This is of centzal interest to the pinch type of plasma fusion reactor concept. We expect to show by this work that current shear can have a stabilizing influence on plasma pinches.

BIBLIOGRAPHIC REFERENCES: C. Barnes, O. Buneman, et al., Localized Structures and Anomalous DC Resistivity, Phys. Rev. Lett. 38, No. 22, 1283 (1977); O. Buneman, The Advance from 2-D Electrostatic to 3-D Electromagnetic Particle Simulation, Comp. Phys. 12, 21 (1976).

SUPPORTED BY U.S. Dept. of Energy, Div. of Controlled Thermonuclear Research

8.0002, PROPERTIES OF BULK AND LAYERED III-V SEMICONDUCTOR COMPOUND FOR ELECTRO OPTIC COMPONENTS

H.H. Caspers, U.S. Dept. of Defense, Navy, Naval Ocean Systems Center, Electronics Engineering & Sciences Dept., *San Diego, California* 92152 (DN887544)

Determine the optical properties of bulk and layered III-V compound semiconductors.

Determine the index of refraction and extinction coefficient as a function of energy. Measure and calculate pertinent optical properties from reflection and transmission spectra obtained from bulk and layered structures of III-V compound semi-conductors. Obtain excitation and emission spectra on Ga(x)In(1-x)As(x)P(1-y)/InP. Special emphasis will be devoted to III-V structures for use as photovoltaic detectors for the wavelegnth region beyond 1 micron.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Material Command

8.0003, ROLE OF PHYSICAL AND PHYSIOLOGICAL CAPACITIES AND THEIR MODIFICATION ON THE TOLERANCE TO VARIOUS STRESS

E.M. Bernauer, University of California, Davis Campus, School of Letters & Science, Dept. of Physics, *Davis, California* 95616 (DF050480; AFOSR-78-3510)

AF function - Air Force operations expose personnel to a wide range of environmental stresses. With the introduction of high-performance aircraft into the tactical arena, high sustained g forces pose serious limitations on the crew member's ability to function at levels that may approach or exceed physiological tolerances. Deficiency - methodology is needed to predict and quantify physiological performance under a combination of operational stresses encountered by Air Force crew members. Objective - this research should provide data for validating conditioning regimens leading to satisfactory levels of tolerance and to screening and predictive models for use in selecting and monitoring personnel. How research contributes - the research supports USAFSAM and amrl studies dealing with protective equipment and setting design criteria for crew habitability and selection, and is identified under 1.5, 1.6, and 1.7.

This effort will seek to reexamine the role of exercise conditioning as a means of improving tolerance to high sustained g. Measured differences in physiological responses between men and women to standardized stress tests of either exercise or orthostatic tolerance will be made. An attempt will be made to identify the physiological variables underlying plus gz tolerance, and the extent these can be modified to enhance tolerance.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0004, DC AND FAR INFRARED TRANSPORT STUDIES OF SUPERIONIC CONDUCTORS

L.B. Coleman, University of California, Davis Campus, School of Letters & Science, Dept. of Physics, *Davis, California* 95616 (10077-G5)

It is proposed that a study of the transport properties of superionic conductors be initiated.

The research program would consist of several parts. By combining a program of modification of known superionic conductors with studies of the ionic transport at low frequencies (DC to far infrared) disordered lattices and the thermodynamics of atomic and diffusion will be studied.

Many of these compounds undergo well-defined phase transitions which signal the onset of high ionic conductivity due to a 'melting' of the diffusing ion sub-lattice. Why these transitions occur in some materials and not others is an important question whose answer is sought in this study. Therefore, particular emphasis will be placed in the temperature regions of these phase transitions.

Experimentally three different techniques would be employed in this study. The DC ionic conductivity measurement, widely used as a measure of ion diffusion rates, will be used to screen and characterize new materials. The thermal properties of the disordered conducting ion sub-lattice will be investigated via thermoelectric power measurements. The major effort would be placed in studying the dynamics of the ionic motion using far infrared spectroscopy. Extending the :measurements from zero frequency into the far infrared will supply understanding of the energies involved in moving the ion through the lattice.

SUPPORTED BY American Chemical Society

8.0005, DETERMINATION OF ABSORPTION CROSS SECTIONS OF HO2NO2 AT ATMOSPHERICALLY RELEVANT WAVELENGTHS

Unknown, University of California, Irvine Campus, Graduate School, *Irvine, California* 92664 (FA78WA-4248; FA161588 (TRAIS NO.))

An investigation will be conducted to measure the absorption cross-sections and quantum yields of all product branches in the photolysis of peroxynitric acid (HO2NO2) over the wavelength range relevant to stratospheric radiance condition (185-700 nm). The investigation will be based on the following items; 1) HO2NO2 will be generated in a continuous mode in a flowing gas mixture; 2) the concentration of HO2NO2 will be characterized

by its infrared absorbence; 3) the infrared band strengths will be predetermined and calibrated by titrating the flowing gas mixture with potassium bromide (KBr) with photometric measurement of bromine (Br2); and 4) the ultra-violet (UV) absorbence will be subsequently determined with a reproducibility of at least .001 absorbence units.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

8.0006, STUDIES OF NONLINEAR PHENOMENA IN HIGH-TEMPERATURE PLASMAS

P.K. Wang, University of California, Los Angeles Campus, School of Engineering & Applied Science, Dept. of Systems Science, *405 Hilgard Ave., Los Angeles, California* 90024 (DF038270; AFOSR-74-2662)

AF function - operation of high-altitude vehicles in a post nuclear explosion environment, development of electromagnetic weapons, space and ionospheric communications as well as countermeasures demand the understanding of nonlinear phenomena occurring in high temperature plasmas and specifically the interaction of electromagnetic radiation with plasmas and the resulting instabilities. Deficiency - the aforementioned information needed to design advanced equipment is not available to date. Its acquisition may be realized by a well-planned theoretical and experimental research program. Objective - this project will investigate theoretically and by computer experimentation (a) bifurcation phenomena in nonlinear plasmas, (b) parameter identification in high-temperature plasmas, (c) plasma heating by neutral injection and (d) feedback stabilization and control. of high temperature plasmas. Contribution - this work is a part of a comprehensive program of plasma research for the development of an x-ray radiation source for simulation of nuclear weapon effects, the development of advanced electromagnetic weapons (laser and particle beam), the development of space and ionosxheric communications and the development of countermeasures.

This project will perform theoretical work and computer simulation experiments in the areas: (a) Plasma turbulence. To develop a plasma turbulence theory based upon bifurcation theory. (1) Investigate the stability and interaction of three-dimensional Langmuir solitary waves. (2) Develop conditions for the existence and nonexistence of general Langmuir solitary waves. (3) Study the existence of nonlinear dynamic modes such as 'spikons' for multidimensional Langmuir waves and their interactions. (b) Plasma heating by neutral injections. Examine the problem of finding an injection current program which will maximize the peak electron or ion temperature at a given time with minimum input energy. (c) Identification, control and stabilization of high-temperature plasmas. Investigate the feasibility of the global behavior controls rather than localized ones using microprocessors. At first the feedback stabilization of low-frequency MHD modes and convective instabilities will be considered. This will be followed by a meaningful small-scale experiment.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0007, SIMULATION OF IONOSPHERIC EM-PLASMA INTERACTIONS IN A LARGE LABORATORY DEVICE

A.Y. Wong, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Physics, *405 Hilgard Ave., Los Angeles, California* 90024 (DF044880; F49620-76-C-0011)

AF function - operation of high-altitude vehicles in a post nuclear explosion environment, development of electromagnetic weapons, both laser and beam weapons, space and ionospheric communications and countermeasures demand design data which can only be obtained from fundamental understanding of high-temperature high beta plasma. Deficiency - present day understanding of high-temperature high-beta plasmas, e.g., waves and instabilities as well as localized phenomena cavitons and solitons is incapable to satisfy the aforementioned requirements. Objective - this research will develop suitable instrumentation such as microwave holography and microwave tomography to perform experiments on steady and unsteady plasmas at various conditions of density and temperature. Contribution - this work is a part of a comprehensive program of plasma research for the development of an x-ray radiation source for simulation of nuclear weapon effects, the development of advanced electromagnetic weapons (laser and ion beam), the development of space and ionospheric communications, and the development of countermeasures.

Previous work found that the linear conversion of EM waves to electrostatic waves produces a large amplitude electric field near the resonant location. The presence of this enhanced field leads to the nonlinear caviton state. Along with the development of this state, fast electrons and ions are observed on both sides of the resonant location. The foregoing will be expanded to the case when a magnetic field is superimposed on the plasma. They expect to examine the following three cases: a. The ordinary mode, b. The extraordinary mode, and c. The electromagnetic mode. In addition they will study the space and time development of the evanescent electric field. Subsequently the characteristics of parametric instabilities in the ionosphere will be investigated and thus prove or disprove certain published theories specifically the one by Perkins (our co-PI at Princeton), that the electron plasma waves generated through parametric decay can only propagate in a small cone about the magnetic field.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0008, RESONANCE STUDIES OF SUPERIONIC CONDUCTORS

V. Jaccarino, University of California, Santa Barbara Campus, School of Letters & Science, Dept. of Physics, *Santa Barbara, California* 93106

The following investigations are underway: NMR and EPR study of superionic and related compounds; use of magnetic ions as a probe of activated motion; use of fast decay of the electronic spin correlation functions in magnetically dense compounds to probe activated hopping in the 10/sup -11/ to 10/sup -12/ s time domain; EPR to study electrode-electrolyte interfaces; 19F NMR in KMn/sub x/Mg/sub 1-x/ and in Mn-doped PbF3, EPR of ion interchange in rutile structure crystals. (ERDA-77-123)

SUPPORTED BY U.S. Dept. of Energy, Div. of Basic Energy Sciences

8.0009, SEMICONDUCTOR MATERIALS

H. Lessoff, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN880010)

To purify starting materials, to develop processing technology and to grow bulk single crystals and epitaxial layers of semiconducting materials including those from groups IV, II-VI, and III-V needed by the Navy for solid-state electronic and electrooptic devices.

Single crystals of such materials are gallium arsenide, silicon, indium phosphide, gallium-indium-arsenide-phosphide, are grown by a variety of techniques including liquid encapsulated czochralski, liquid and vapor phase epitaxy, and travelling solvent freezing. Various technologies are used for purification and compounding including high pressure reaction, vapor baking, zone melting, vapor phase condensation, and vacuum transport. Novel techniques are continuously being sought to reduce the background impurity levels, to develop better doping methods, to increase crystal perfection and to develop new compounds having desirable optical, and semiconducting properties for Navy needs at the microwave, millimeter wave and optic wave lengths. New material combinations are being prepared for potential useful applications.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0010, MAGNETIC SURFACE WAVE RESEARCH

D. Webb, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN880054)

Surface-acoustic-wave (SAW) devices have been proven to be highly effective in signal processing applications where speed, size, weight and power consumption are critical. The objective of

this program is to increase the versatility of SAW filters and delay lines by developing techniques for electrically tuning them. Potential applications for tunable SAW devices include electrical beam steering in adaptive arrays and correction of errors introduced by temperature drift, Doppler shift or inadequate control of fabrication processes.

Geometries consisting of magnetostrictive films on piezoelectric substrates will be characterized theoretically and experimentally. The objective is to find the configuration which will provide significant tunability with a minimum applied field while maintaining a low insertion loss. Candidate magnetic materials are the met-glass (Fe-Si-B) and rare-earth-iron (Tb-Dy-Ho-Fe) compounds.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0011, FIRST PRINCIPLES CALCULATION OF FERROELECTRIC AND PIEZOELECTRIC SOLIDS

C.A. Uzes, University of Georgia, Franklin College of Arts & Sciences, Dept. of Physics & Astronomy, *Athens, Georgia* 30601 (DF044180; AFOSR-76-3045)

AF function - microwave electronic devices are essential elements of Air Force reconnaissance and surveillance systems. Opportunity -improved performance in these systems can be expected from the use of better solid-state materials in devices. Objective- the objective is to calculate energy bands, polarization, pyroelectric coefficients and pizoelectric coefficients of several ferroelectric crystals including lithium niobate and lithium tantalate. How work contributes - this research will identify those materials which have the best prospects for use in electronic devices such as pyroelectric image tubes.

The calculational technique is based on a Hartree-Fock formulism which requires no input of experimental data other than crystal symmetry and involves no adjustable parameter.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0012, ELECTRONIC STRUCTURE OF SOLIDS AND THEIR SURFACES AND INTERFACES

A.B. Kunz, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Physics, *Urbana, Illinois* 61801 (DF043360; AFOSR-76-2989)

AF function - Air Force functions such as communications, reconnaissance and surveillance, and command and control depends heavily upon modern electronic systems. Opportunity - improved performance in electronic systems can be achieved once a detailed and complete knowledge of electronic materials is available. Objective - the objective of this research is to determine electronic structure, impurity states and surface properties of materials with potential for improvement of current semiconductor devices. How work contributes -these studies will contribute to the understanding of the electronic properties of device materials and of the effect of impurities and their migration of these materials in such applications as MOS, MIS and heterojunction devices.

Unrestricted Hartree-Fock clusters and pseudopotential calculational techniques will be used to study the electronic structure of III-V binary, ternary, and quaternary semiconductors useful as microwave device materials, the surface of simple metals and their response to simple impurities such as oxygen on Al, the surface structure of simple semiconductors and their response to simple impurities such as oxygen and nitrogen on Si, GaAs and InP, and the surface structure of complex metals and this response to oxygen, hydrogen, nitrogen, and carbon.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0013, THEORY OF SUPERIONIC CONDUCTORS

G.D. Mahan, Indiana University, Bloomington Campus, School of Arts & Sciences, Dept. of Physics, *Memorial Hall, Bloomington, Indiana* 47401 (DF045800; AFOSR-76-3106)

AF function - this proposed research primarily falls in the 5.3 ROS which deal with electrical power from non-nuclear energy sources. In particular the use of superionic conductors as solid electrolytes has high potential for development of new batteries and energy storage devices. These batteries will be used for electrical power in manned and unmanned aircraft, satellites and space stations, as well as electrical power for unattended ground based systems. Deficiency - substantial improvements are needed in organic and solid electrolytes to increase conductivity to that achieved in aqueous electrolytes. These solid electrolytes have a much wider temperature range and are needed for use in new high-energy, high-charge and -discharge rates rechargeable batteries in future aircraft applications as well as space applications. Objective - the objective of this research is to develop accurate theoretical models for ionic conductivity. Contribution - this research is a part of a comprehensive program in superfluids and superconductors.

Renormalization group methods will be used to study order-disorder models in real superionic conductors. The PIS apparently are the only group in the world doing these calculations with this technique. They will, using a new method they recently developed, do the calculations of ionic conductivity in three dimensions, for different lattices and for arbitrary concentrations and temperatures. This will allow them to predict the dependence of activation energy on the concentration of particles, temperature and the interaction between particles.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0014, RESEARCH ON TERRESTRIAL GENERAL RELATIVITY EFFECTS USING ATOMIC CLOCKS AND AIRCRAFT

C.O. Alley, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Physics, *College Park, Maryland* 20742 (DF048090; AFOSR-77-3268)

AF function - the AF has the responsibility of providing highly accurate time and frequency standards for use in high-precision navigation systems such as the global positioning system. Deficiency-methods for correcting for gravitational potential effects on measured time rates have not been properly incorporated into advanced navigational systems. Objective - the objective of this program is to clarify the effects of gravitational potential upon measured time rates as predicted by general relativity. The specific areas to be investigated are (1) the effect of latitude on clock rates, (2) the effect of the gravitational potential of the sun on clock rates, and (3) an accurate measurement of the effect of earth rotation on time. Contribution - this research will contribute to the development of highly accurate navigational systems for aircraft and missile use.

The existence of commercially available cesium atomic clocks, which exhibit stabilities of 2 x 10 (-14) per day when their environment is suitably controlled, allows significant measurements to be made in a terrestrial environment of the general relativistic effects on time. Of major interest is an investigation of the rate of clocks placed at different latitudes. General relativity predicts that the change in velocity due to earth rotation in going from the equator to the pole is just compensated by the change in gravitational potential along the geoid. Comparison of clocks that have been at different latitudes (with proper correction for the effect of transporting them) will provide an interesting null experiment. Of next interest is an investigation of the rate of clocks at different latitudes on the earth as they are affected by the gravitational potential of the sun. At the time of the solsticies, 22 December and 22 June, the axis is tilted 23.5 degrees away from or toward the sun, resulting in different average solar gravitational potentials at different latitudes. General relativity predicts that the clock rate difference expected from the solar potential difference is cancelled by orbital velocity differences.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0015, FUNDAMENTAL PROPERTIES OF SUPERCONDUCTORS

W.J. Skocpol, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Engineering & Applied Physics, *Cambridge Station, Cambridge, Massachusetts* 02138 (DMR7904155)

The proposed research is a continuation and extension of work supported under NSF Grant No. DMR-7611323; it is a

broad program encompassing experimental and theoretical studies with emphasis on nonequilibrium superconductivity. Studies of the relaxation rate of quasiparticle charge in superconducting microstrips will be extended to other geometries. This will permit the use of magnetic field to control the coupling between two or more superconducting phase-slip centers or Josephson junctions. Work on disequilibrium induced by far-IR and optical lasers will allow detailed study of the generation and relaxation of nonequilibrium quasiparticle population. Theoretical work will be carried out on the development of a theory of propagating damped branch-inbalance waves in superconductors. Theoretical and experimental studies of the dependence on anisotropy of the resistance in inhomogeneous systems near the percolation threshold will also be carried out.

First year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0016, RELAXATION PHENOMENA IN OPTICALLY-PUMPED MERCURY ISOTOPES

J.H. Simpson, Singer Co., *1150 McBride Ave., Little Falls, New Jersey* 07424 (DF035170; F49620-76-C-0009)

AF function - this research is being supported in response to RN-AFAL-05-72-1, nuclear magnetic resonance gyro improvements. Deficiency -the magnetic resonance gyro has considerable potential for Air Force applications. Objective - research is directed toward determining the nature and range of magnetic interactions and the factors which can change the nature and range. Contribution - the magnetic resonance gyro will be ideal for strapdown systems having an extremely high dynamic range, high g capabilities and small size. Possible users are aircraft and missile weapons systems.

This research involves an experimental and theoretical investigation of the sources of noise and drift in an NMR controlled oscillator and an experimental investigation of the fundamental interactions between population distribution over the magnetic sublevels.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0017, ATOMIC PHYSICS RESEARCH

K.W. Jones, U.S. Dept. of Energy, Brookhaven National Lab., *Upton, New York* 11973

The following topics are being studied: properties of highly ionized species found as fusion plasma contaminants; mechanisms for production of inner-shell vacancies in heavy ion-atom collisions; measurements of the impact parameter dependence and total cross sections for production of characteristic x-rays; beam foil spectroscopy measurements in the x-ray and vacuum ultraviolet regions to determine lifetimes and investigate atomic structures; cross sections for electron impact excitation and ionization of highly ionized heavy-ion beams for the electron energy range up to 20 keV. Three-stage MP Tandem Van de Graaff, beams of ions ranging from H to U with energies up to 250 MeV; 3.5-MV Van de Graaff for low-energy, light ions. (DOE/ER-0002)

SUPPORTED BY U.S. Dept. of Energy, Office of Energy Research

8.0018, ELECTRONIC PROPERTIES OF MATERIALS

R.J. Higgins, Oregon State Higher Education System, University of Oregon, School of Liberal Arts, Dept. of Physics, *1472 Kincaid St., Eugene, Oregon* 97401 (DMR7823011)

DeHaas-van Alphen (dHvA) effect spectroscopy will be used in characterizing the electronic properties of materials. The technique samples the conduction electrons as a whole in real space but locally in monentum-space. Spin-resolved dHvA waveshape analysis will be used to track spin dependent scattering and g-shifts in magnetic impurity systems based upon noble metals and exchange enhanced transition metals. High-sensitivity dHvA spectral analysis will be used to study electronically driven order-disorder phase transitions in Cu3Au. The amplification of small energy shifts due to the high quantum phase will be used to determine how the ferromagnetic energy gap changes as the temperature approaches the critical temperature in ZrZn2.

This is the first year of a three-year continuing grant.

This research was previously supported under DMR 7614878.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0019, THE FEW-BODY PROBLEM IN MOLECULAR PHYSICS

T. Lim, Drexel University, School of Science, Dept. of Physics, *32nd & Chestnut Sts., Philadelphia, Pennsylvania* 19104 (PHY7819375)

A research program in molecular physics will be initiated in which detailed numerical computations will be completed in the Faddeev-Yakubovsky and variational treatments of the microscopic behavior of the few-atom systems of the rare gases. Topics to be investigated include: The accurate evaluation of the binding energies of the clusters of three and four like as well as admixed atoms. A study of atom-atom, atom-diatom, diatom-diatom, and atom-triatom reactive collisions.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0020, CALCULATIONS OF SURFACE PROPERTIES OF CRYSTALS

F.W. deWette, University of Texas, Austin Campus, School of Arts & Sciences, Dept. of Physics, *200 W. 21st, Austin, Texas* 78712 (DMR7810309)

Research previously supported by DMR7518492.

A number of problems concerning the structure and the vibrational and related properties of surfaces of insulating crystals will be investigated. The aim is three-fold: (1) to continue the investigation of intrinsic phenomena of well-characterized simple idealized surfaces of molecular and ionic crystals; (2) to study the consequences of these intrinsic phenomena for surface experimental methods, such as infrared absorption, Raman and low-energy atom and ion scattering, and thermodynamic measurements; (3) to investigate the influence of surface structural and vibrational properties on the interaction with physisorbed 'foreign' atoms, and to study the properties of absorbate-absorbent systems.

Of great importance to these studies is the development of improved shell models for describing the ionic interactions in the bulk and near the surface, which will allow the simultaneous and consistent treatment of both structural and vibrational surface phenomena. The study and the implementation of those model interactions will be a central theme in the research.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0021, EXPERIMENTS USING WEAKLY LINKED SUPERCONDUCTORS

B.S. Deaver, University of Virginia, School of Arts & Sciences, Dept. of Physics, *Garrett Hall, Charlottesville, Virginia* 22903 (DMR7825791)

This is a continuation and extension of research sponsored under Grant No. DMR74-00424. General objectives of this research are to obtain new information about several fundamental properties of superconductors dealing with Josephson effects and macroscopic phase relations as well as to use Josephson devices to perform new types of measurements. Particular emphasis will be placed on the development of several types of weakly-linked superconductors such as variable thickness microbridges, semiconductor barrier and micro-tunnel junctions and to use these devices to obtain detailed data with regard to the frequency dependence of the Josephson current and nonequilibrium phenomena in such structures. A newly developed superconducting susceptometer facility will be used to investigate weak magnetic interactions is a wide variety of materials. This research is important for our fundamental understanding of the consequences of the macroscopic quantum state as manifest in the unique properties of the superconducting state.

First year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0022, METAL VAPOR PLASMAS CREATED BY LASER ABLATION

R.M. Measures, University of Toronto, *92 College St., Toronto, Ontario, Canada* M5S 1B2 (DF041850; AFOSR-76-2902)

AF function - operation of high-altitude vehicles in a post nuclear explosion environment. Development of electromagnetic weapons, space and ionospheric communications as well as countermeasures demand new types of highly efficient and effective lasers. Such lasers are metal vapor lasers. Deficiency - little information is available today in understanding the fundamental processes of operation of metal vapor lasers. Its acquisition may be realized by well-planned theoretical and experimental research. Objective - this project will investigate both theoretically and experimentally laser ablated metal vapor plasmas, using selective laser excitation spectroscopy to study the dependence of the degree of excitation of the metal vapor plasma upon the wavelength and pulse duration of the ablation laser. Contribution - this work is a part of a comprehensive program of plasma research for the development of an x-ray radiation source for simulation of nuclear weapon effects, the development of advanced electromagnetic weapons (laser and particle beam), the development of space and ionospheric communications, and the development of countermeasures.

This project will study various aspects associated with the development of x-ray lasing media, specifically, a. Refinement of the LIBORS computer code, b. Checking experimentally the accuracy of the LIBORS code, c. Use of the LIBORS model and computer code to obtain a better understanding of the relative merits of inverse bremsstrahlung and resonance saturation combined with superelastic collision quenching as a means of converting laser energy into plasma energy, d. Try to verify experimentally the results of the comparative study by measuring the relative degree of ionization attained when the ablation laser is tuned or detuned from the resonance transition of the singly ionized species. The degree of ionization can be measured directly from the ratio of the intensified emission observed on the resonance transitions of the ion to neutral species when each is laser saturated, e. Use the LIBORS code to check the feasibility of the resonance pumping scheme for x-ray laser generation, f. Extend the laser radiative lifetime technique to levels that are not optically coupled to the ground state by two wavelength excitation and see if this approach can also be applied to multi-ionized species that freeze out after ablation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0023, DEFECTS DISORDER PRODUCED BY ION IMPLANTATION IN SOLIDS

M. Balkanski, Universite de Paris, *Paris, France* (DA0D9372; DAERO 78 G0002)

Ion implantation is an important technique for doping semiconductors, vital to military electronics. The disordered layer produced by implantation is only partially restored by annealing, particularly in GaAs. The critical processes involved will be investigated.

The investigation will proceed in two steps: (1) The first step (18 months) will be related to low-medium doses (10 to the 12th power/10 to the 14th power at/cm sq) implanted S and Se in about 20 samples: These samples will be obtained from the same semi-insulating ingot. The thermal stability of this ingot will be characterized prior to implantation. The profile of defects just after implantation (Raman spectrum as a function of wavelength or chemical dissolution step by step) and the kinetics of recrystallization at low temperature (100 degrees C-300 degrees C) will be determined. The role of an encapsulating layer (Si sub 3 N sub 4 for example) will be studied. Electrical characterization will be done after high-temperature anneal (up to 950 degrees C). (2) The second step (18 months) will be related to high doses (10 to the 15th power-10 to the 17th power at/cm sq.) of implanted Al. This approach will benefit on the previous one. Implanted Al profiles will be studied by sims just after implantation and after an annealing treatment at high temperature (900 degrees c). Doses and energies will then be defined in order to obtain a flat profile extending on 2000 a. Thermal recovery of the crystallization will be studied by Raman spectroscopy and luminescence.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Research & Standardization Group

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, SOLAR AND PLANETARY VARIATIONS NEAR SOLAR MAXIMUM

G.W. Lockwood, Lowell Observatory, *P.O. Box 1269, Flagstaff, Arizona* 86001 (ATM7817325)

Observations made since 1972 of Uranus, Neptune, and Saturn's satellite Titan have revealed linear brightness increases of a few percent, possibly associated with decreasing solar activity during the declining phases of solar cycle 20. Some solid bodies in the solar system such as the Galilean satellites of Jupiter may have brightened also. In 1977 and early 1978, Titan and Neptune began to decrease in brightness, while at the same time solar activity began to increase.

Because the brightness changes varied in amount from object to object, a simple increase and subsequent decrease in the solar constant appear ruled out as an explanation, but even more intriguing is the possibility that changes in solar activity may trigger albedo changes in some of the planets.

This grant will continue observations of these objects plus the Galilean satellites of Jupiter and Rhea, another satellite of Saturn, for two more years, until solar maximum is reached in 1980. If, in fact, there is a correlation between solar activity and the brightness of planets and satellites, it should be revealed more clearly during this period, in which solar activity should exceed any level attained since the beginning of this program.

In addition, intensive measurements will be made simultaneously from two observing locations during two month-long intervals near solar maximum to search for planetary responses to transient manifestations of solar activity such as major flare outbursts.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0002, RADIO ASTRONOMICAL STUDIES

W.J. Welch, University of California, Berkeley Campus, School of Letters & Science, Dept. of Astronomy, *Berkeley, California* 94720 (AST7821037)

Detailed observations of molecules in the galaxy will be continued with the millimeter wave interferometer. Studies will be made of carbon monoxide, water vapor, methanol and other molecular clouds in interstellar space. Measuring the molecular line radiation provides the only way to probe the internal conditions of the cool, dark clouds in which stars are forming.

Observations will also be made of planets. The temperature and general characteristics of the surface of many planetary objects, such as the rings of Saturn will be determined.

The highly energetic quasars will be the target of study as well. The short millimeter wavelengths penetrate much closer to the as yet unexplained energy source giving hope that these observations can better define this prodigious energy source.

The interferometer will continue to be upgraded with new receivers, a new control computer, and better and more efficient data handling equipment.

The 85-foot telescope, which works in a nearly automatic mode, will be used as one station in the intercontinental Very Long Baseline Interferometry network. Longer term surveys of the hydrogen gas in our galaxy is providing insight into the way the nearby gas in our own galaxy behaves. These projects will be continued.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0003, STUDIES OF WHITE-DWARF STARS
H.L. Shipman, University of Delaware, School of Arts & Sciences, Dept. of Physics, *Newark, Delaware* 19711 (AST7824555)

Our current understanding of stellar evolution indicates that when the the Sun uses up all of its nuclear fuel, it will end its life as a ball of gas no larger than the earth -- as a white-dwarf star. Our understanding of this final state and of the fate of other low mass stars like the Sun is obtained through the analysis of light from white-dwarf stars.

Recent advances in the application of new types of detectors to astronomical observations have resulted in a dramatic increase in the amount of spectroscopic and photometric information on these objects. The determination of the physical properties of the white-dwarf stars requires analysis of the light and other forms of electromagnetic radiation that they emit. The principal thrust of the research to be carried out on this project will be an effort to model the layers of white-dwarf stars that emit radiation and the comparison of the models with currently available data to determine the masses, radii, temperatures, and chemical compositions of these stars. A deeper understanding of these properties will provide us with a firmer understanding of the last stages in the life of a low mass star.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0004, STUDIES OF COOL STARS USING SYNTHETIC SPECTROSCOPY
R.A. Bell, University of Maryland, College Park Campus, School of Engineering, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (AST7721094A01)

The research described in this proposal will improve our knowledge of the physical properties of stars in our own and in nearby galaxies. The tools to be used for this purpose are a set of computer programs and a large file of data for atomic and molecular spectral lines. One computer program will be used to compute mathematical models of stellar atmospheres. These models are flux-constant and include convection and a detailed treatment of the effects of line absorption on the atmospheric structure. The models ahd atomic and molecular data will be used to compute theoretical stellar spectra and theoretical colors. The spectra and the colors will be compared with observed stellar spectra and colors. The best fits will yield the temperatures, gravities and chemical compositions of the stars.

The primary topics to be investigated in the present proposal are the properties of cool giant stars, with particular emphasis on globular cluster stars and their peculiarities, and the calculation of model atmospheres for other types of stars such as F and G dwarfs, cepheid variables, RR Lyraes and M giants. Other work will be concerned with the interpretation of spectroscopic K line measurements of RR Lyraes, the abundance and gravity sensitivity of TiO bands and the calculation of limb darkening coefficients.

This is a continuation of NSF Grant AST77 21094.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0005, THEORETICAL ASTROPHYSICS AND COSMOLOGY
P. Morrison, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (AST7722907A01)

Research on a number of topics in theoretical astrophysics and cosmology will be carried out. The main areas of study include: 1) neutron star properties including equations of state, possible quark-nucleon phase transitions, and neutrino cooling; 2) thermal and non-thermal radiation from white dwarfs, including further consequences of our 'bloated dwarf' model of novae; 3) models of slow ('transient') and fast ('burst') variable galactic X-ray sources; 4) physics of supernova explosions, particularly acceleration of cosmic rays by the initial event; 5) double radio source ejection from active galaxy nuclei, and further study of the radiation from galactic nuclei themselves; 6) physical cosmology, including physical models of a 'cosmological constant', and constraints on variation in microscopic fundamental 'constants' set by observations of distant objects; and 7) astrophysical process, particularly magnetic field generation and annihilation in stars and in the less dense plasmas found in supernova remnants and double radio sources. There will be a cooperative program carried out with Dr. A. Cavaliere of the Institute of Astronomy of the University of Padua, Italy.

This is a continuation of research done under grant AST 77-22907.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0006, STELLAR PHYSICS - FAR-INFRARED BALLOON-BORNE TELESCOPE
G.G. Fazio, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138

A cooperative program has been initiated among the Smithsonian Astrophysical Observatory, Harvard College Observatory, and the University of Arizona to construct a 40-inch telescope, to be launched on a high-altitude balloon, to investigate the far-infrared spectrum of celestial sources. The first flight is expected in the summer of 1972.

SUPPORTED BY Smithsonian Institution, Astrophysical Observatory

10.0007, THE EVOLUTION OF SELF-GRAVITATING SYSTEMS
M. Lecar, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (SFC 8 7006)

With the aid of computer simulation, the nonlinear dynamical evolution of Clusters of Galaxies and of Globular Clusters is being studied. In the case of Clusters of Galaxies, an attempt to find the 'missing mass' is being made by investigating the result of different forms of the 'missing mass' on the density distribution of the cluster. The difference between the observed mass and the amount needed to stabilize the cluster is approximately a factor of 10, and constitutes the amount of mass needed to 'close' the Universe.

In the case of Globular Clusters, an attempt is being made to answer the question: why, in contrast to elliptical galaxies, which otherwise resemble these clusters, are the clusters predominantly round?

SUPPORTED BY Smithsonian Institution, Office of Fellowships & Grants

GENERAL

11.0001, NOTABLE CONTRIBUTORS TO FLIGHT TECHNOLOGY
H.S. Wolko, Smithsonian Institution, Dept. of Science & Technology, *1000 Jefferson Dr. S.W., Washington, District of Columbia* 20560

The intent of this research is to provide the community of aerospace historians with information relative to notable contributors to flight technology. Many of the individuals who have made major contributions to the technology of flight have attracted little attention, yet their accomplishments are responsible for progress in the field.

Thumbnail biographical sketches of some 130 individuals (selected by committee) will be prepared. Although the sketches are to be non-technical, source references will be included. A topical format, preceded by a brief overview of progress in the particular topic, has been selected as most appropriate. Individuals will be presented chronologically within each topic.

PROGRESS: 129 of 130 individuals have been researched. A rough draft thumbnail sketch has been prepared. Introductory overviews are in preparation.

SUPPORTED BY Smithsonian Institution, National Air & Space Museum

11.0002, PARTICIPATION IN MARINER JUPITER/SATURN 1977 IMAGING SCIENCE TEAM
A. Cook, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (173720-31P; 953617)

Provide services of Dr. Cook II, in his capacity as a member of the Imaging Science Team for the MJS 1977 Project. Conducting and reporting technical studies as assigned by Team Leader. Implement a definitive set of task descriptions and associated support for duration of project. Assist in preparation of theoretical models to be compared with imaging data. Provide services of computer programming as needed.

SUPPORTED BY Smithsonian Institution, Astrophysical Observatory

11.0003, DEVELOPMENT OF ATMOSPHERIC MODELS
L. Jacchia, Smithsonian Institution, Astrophysical Observatory, Geoastronomy Division, *60 Garden St., Cambridge, Massachusetts* 02138 (SRF 450123)

Atmospheric research using satellite-drag and composition data has been carried out at Smithsonian Astrophysical Observatory (SAO) since 1959. At this time, fundamental information concerning atmospheric structure, density, composition, and variations is being revealed. Instrumented satellites are now providing composition data that will allow the development of accurate and complete models of the atmosphere and its variations.

The five activities planned for the total SAO FY-75 program of Upper Atmospheric Research are outlined below. The SRF grant will primarily be used for computations required for parts A and E below, and will be coordinated with SAO's NASA program: A. Present temperature models are based on the 10.7-cm solar-flux index; new ones will be developed from an extreme-ultraviolet (EUV) index derived from data collected by the Atmospheric Explorer satellite (AE-C) and from satellite drag. B. Models for the departures of composition from the static-diffusion model will be refined. These models will be able to represent variations in composition observed by mass spectrometers on the OGO-6, ESRO-4, and AE-C satellites, temperature variations observed through Doppler monitoring of the 6300 A airglow line on OGO-6, and density determinations from SAO drag data. C. The geomagnetic effect on composition will be determined by comparing number-density measurements from the ESRO-4 satellite with geomagnetic data. D. The rotation of the atmosphere will be deduced by observing the secular decreases in the orbital inclinations of seven satellities. The drag associated with a particular value of rotation is modeled very precisely since these satellites already have effective atmospheric densities determined as a function of time. This work will involve the analysis of satellite-orbit and density data already at SAO. E. The density determinations for FY 1970, 1971, and 1972 have been completed and will be published, while new ones will be made and published for FY 1973 and 1974. Emphasis will be given to the period when the AE-C satellite is making in situ measurements of the EUV flux to be used in correlative analyses.

SUPPORTED BY Smithsonian Institution, Office of Fellowships & Grants

11.0004, SURVEY OF ARABIC SCIENTIFIC MANUSCRIPTS IN CAIRO (MEDIEVAL ISLAMIC ASTRONOMY)
O.J. Gingerich, American Research Center in Egypt Inc., *20 Nassau St., Princeton, New Jersey* 08540 (SF3-11497)

A second phase of the Smithsonian Institution Project currently established at the American Research Center in Egypt. The research to be conducted shall include the preparation of a detailed analysis of selected medieval scientific manuscripts in the Egyptian National Library whose importance has been ascertained during the recent cataloging project; a series of publications on selected themes in Islamic astronomy that have not yet received the attention they merit in view of their importance for the history of science; an investigation of the medieval astronomical instruments preserved in Cairo; and a comprehensive survey of the astronomical handbooks that were used by the astronomers of medieval Islam. We maintain that such research will add greatly to our present knowledge of the development of mathematical astronomy in medieval Islam and, indeed, will make available material for a new chapter in the history of science.

SUPPORTED BY Smithsonian Institution, Office of Fellowships & Grants

VOLUME 17 NUMBER 23 / DECEMBER 8, 1979

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N79-32150* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING. A CONTINUING BIBLIOGRAPHY, SUPPLEMENT 112
Aug. 1979 124 p
(NASA-SP-7037(112)) Avail: NTIS HC E02 CSCL 01A

This bibliography lists 424 reports, articles, and other documents introduced into the NASA scientific and technical information system in July 1979. Author

N79-32151*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
EFFECT OF ELEMENT DENSITY ON THE NASTRAN CALCULATED MECHANICAL AND THERMAL STRESSES OF A SPAR
Jerald M. Jenkins Oct. 1979 14 p refs
(NASA-TM-72868; H-1104) Avail: NTIS HC A02/MF A01 CSCL 20K

A NASTRAN model of a spar was examined to determine the sensitivity of calculated axial thermal stresses and bending stresses to changes in element density of the model. The thermal stresses calculated with three different element densities resulted in drastically differing values. The position of the constraint also significantly affected the value of the calculated thermal stresses. Mechanical stresses calculated from an applied loading were insensitive to element density. Author

N79-32152*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LARGE EDDY SIMULATION OF TURBULENT CHANNEL FLOW: ILLIAC 4 CALCULATION
John Kim and Parviz Moin Sep. 1979 21 p refs Presented at AGARD Symp. on Turbulent Boundary Layer, Experiment, Theory, and Modelling, the Hague, Netherlands, 24-27 Sep. 1979
(NASA-TM-78619; A-7952) Avail: NTIS HC A02/MF A01 CSCL 02A

The three-dimensional time dependent equations of motion were numerically integrated for fully-developed turbulent channel flow. A large scale flow field was obtained directly from the solution of these equations, and small scale field motions were simulated through an eddy viscosity model. The calculations were carried out on the ILLIAC 4 computer. The computed flow patterns show that the wall layer consists of coherent structures of low speed and high speed streaks alternating in the spanwise direction. These structures were absent in the regions away from the wall. Hot spots, small localized regions of very large turbulent shear stress, were frequently observed. The profiles of the pressure velocity-gradient correlations show a significant transfer of energy from the normal to the spanwise component of turbulent kinetic energy in the immediate neighborhood of the wall ('the splatting effect'). R.E.S.

N79-32153# American Power Jet Co., Ridgefield, N.J.
TECHNOLOGY TRENDS AND MAINTENANCE WORKLOAD REQUIREMENTS FOR THE A-7, F-4, AND F-14 AIRCRAFT Preliminary Report, 1 Aug. 1977 - 1 Aug. 1978
Thomas A. Blanco, George Chernowitz, James Ciccotti, and Alan Lee May 1979 38 p refs
(Contract N00123-77-C-0996)
(AD-A070036; NPRDC-TR-79-19) Avail: NTIS HC A03/MF A01 CSCL 01/3

Three major technology variables--system complexity, rate of technological change, and automation in diagnostics--were addressed to determine their significance in formulating a methodology for forecasting maintenance manpower requirements for new aircraft. These variables were analyzed separately for the A-7, F-4, and F-14 aircraft systems, as well as maintenance workload requirements. Conclusions are drawn from the effect of these variables on maintenance manhours per flying hour and distribution of workload among maintenance levels organizational, intermediate, and depot and work centers skills. Results indicate that system complexity, measured in terms of component reliability and density of functions number of parts per subsystem, and rate of testing the manpower requirements of a new aircraft system. Automation in diagnostic did not have significant effect on manpower requirements. The F-14 aircraft had a significantly different maintenance distribution by levels than the A-7 and F-4 models, the biggest shift being from organizational level down 20% from other aircraft to depot level up 71% from other aircraft. This was accompanied by a much greater use of commercial support 96% of total depot support than for other aircraft. GRA

N79-32154# General Accounting Office, Washington, D. C.
CENTRALIZING AIR FORCE AIRCRAFT COMPONENT REPAIR IN THE FIELD CAN PROVIDE SIGNIFICANT SAVINGS
28 Mar. 1979 69 p Prepared by the Comptroller General
(PB-295320/6; LCD-79-409) Avail: NTIS HC A04/MF A01 CSCL 01C

A report to the Subcommittee on Defense, House Committee on Appropriations which explains how the Air Force can use its field component repair resources more efficiently and effectively by centralizing such repair among units with common aircraft is presented. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N79-32155 Rhode Island Univ., Kingston.
AN INVESTIGATION OF LOW REYNOLDS NUMBER FREE VERTICAL JET FLOWS Ph.D. Thesis
Ahdol Reza Faiz 1978 241 p

Avail: Univ. Microfilms Order No. 7915456

A comprehensive method for the analysis of laminar, Newtonian, axisymmetric, vertical jets was developed. The jet is divided into two regions; the one dimensional flow region where the assumptions of the uniform pressure and axial velocity are valid, and the upper jet region, the region close to the passage exit, where the flow is essentially two dimensional. One dimensional flow assumptions result in a nonlinear, second-order ordinary differential equation in the free-surface radius, which is solved numerically. The upper-jet region is analyzed by the finite element method, with the boundary conditions supplied from the one dimensional flow solution. Although the proposed method was tested for small radius Reynolds numbers, less than 1, only, it is expected to give good results for Reynolds numbers as large as 100. The one dimensional flow solution, however, is applicable to all laminar vertical jets, no matter how large the Reynolds number. Dissert. Abstr.

N79-32156*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
AIRCRAFT VORTEX MARKING PROGRAM Final Report
Michael F. Pompa 1 Oct. 1979 47 p refs
(Contract NAS7-100)
(NASA-CR-162299; JPL-Pub-79-77) Avail: NTIS HC A03/MF A01 CSCL 01A

A simple, reliable device for identifying atmospheric vortices, principally as generated by in-flight aircraft and with emphasis on the use of nonpolluting aerosols for marking by injection into such vortex (-ices) is presented. The refractive index and droplet size were determined from an analysis of aerosol optical and transport properties as the most significant parameters in effecting vortex optimum light scattering (for visual sighting) and visual persistency of at least 300 sec. The analysis also showed that a steam-ejected tetraethylene glycol aerosol with droplet size near 1 micron and refractive index of approximately 1.45 could be a promising candidate for vortex marking. A marking aerosol was successfully generated with the steam-tetraethylene glycol mixture from breadboard system hardware. A compact 25 lb/f thrust (nominal) H2O2 rocket chamber was the key component of the system which produced the required steam by catalytic decomposition of the supplied H2O2. M.M.M.

N79-32157*# McDonnell Aircraft Co., St. Louis, Mo.
MULTI-ELEMENT AIRFOIL VISCOUS-INVISCID INTERACTIONS Final Report
L. W. Gross Hampton, Va. NASA 1979 28 p refs
(Contract NAS1-15369)
(NASA-CR-159125) Avail: NTIS HC A03/MF A01 CSCL 01A

Subsonic viscous-inviscid interactions for multi-element airfoils are predicted by iterating between inviscid and viscous solutions until the performance coefficients converge. Inviscid flow is modelled by using distributed source-vortex singularities on configuration surface panels. Viscous effects are calculated by an existing laminar separation bubble model and a NASA-Lockheed boundary layer-wake method. Numerical formulations and example calculations are presented. Author

N79-32158*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF OUTBOARD VERTICAL-FIN POSITION AND ORIENTATION ON THE LOW-SPEED AERODYNAMIC PERFORMANCE OF HIGHLY SWEPT WINGS
Vicki S. Johnson and Paul L. Coe, Jr. Sep. 1979 30 p refs
(NASA-TM-80142) Avail: NTIS HC A03/MF A01 CSCL 01A

A theoretical study was conducted to determine the potential low-speed performance improvements which can be achieved by altering the position and orientation of the outboard vertical fins of low-aspect-ratio highly swept wings. Results show that the magnitude of the performance improvements is solely a function of the span-load distribution. Both the vertical-fin-chordwise position and toe angle provided effective means for adjusting the overall span-load distribution. A.R.H.

N79-32159*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REVIEW OF DESIGN AND OPERATIONAL CHARACTERISTICS OF THE 0.3-METER TRANSONIC CRYOGENIC TUNNEL
Edward J. Ray, Charles L. Ladson, Jerry B. Adcock, Pierce L. Lawing, and Robert M. Hall Sep. 1979 56 p refs Presented at 1st Intern. Symp. on Cryogenic Wind Tunnels, Southampton, Engl., 3-5 Apr. 1979
(NASA-TM-80123) Avail: NTIS HC A04/MF A01 CSCL 01A

The past 6 years of operation with the NASA Langley 0.3 m transonic cryogenic tunnel (TCT) show that there are no insurmountable problems associated with cryogenic testing with gaseous nitrogen at transonic Mach numbers. The fundamentals of the concept were validated both analytically and experimentally and the 0.3 m TCT, with its unique Reynolds number capability, was used for a wide variety of aerodynamic tests. Techniques regarding real-gas effects were developed and cryogenic tunnel conditions can be set and maintained accurately. Cryogenic cooling by injecting liquid nitrogen directly into the tunnel circuit imposes no problems with temperature distribution or dynamic response characteristics. Experience with the 0.3 m TCT, indicates that there is a significant learning process associated with cryogenic, high Reynolds number testing. Many of the questions have already been answered; however, factors such as tunnel control, run logic, economics, instrumentation, and model technology present many new and challenging problems. A.R.H.

N79-32160# Weapons Research Establishment, Salisbury (Australia).
CALCULATION OF SUBSONIC NORMAL FORCE AND CENTRE OF PRESSURE POSITION OF BODIES OF REVOLUTION USING A SLENDER BODY THEORY: BOUNDARY LAYER METHOD
K. D. Thomson Apr. 1979 28 p refs
(WSRL-0093-TR; AR-001-656) Avail: NTIS HC A03/MF A01

A method is presented for predicting the aerodynamic characteristics of slender bodies of revolution at small incidence, under flow conditions such that the boundary layer is turbulent. A panel method based on slender body theory is developed and used to calculate the surface velocity distribution on the body at zero incidence. This velocity distribution is used in conjunction with an existing boundary layer estimation method to calculate the growth of boundary layer displacement thickness which is added to the body to produce the effective aerodynamic profile. Recourse is again made to slender body theory to calculate the normal force curve slope and center of pressure position of the effective aerodynamic profile. Comparisons made between predictions and experiment for a number of slender bodies extending from highly boattailed configurations to ogive-cylinders, and covering a large range of boundary layer growth rates, indicate that the method is useful for missile design purposes. Author

N79-32161*# Boeing Commercial Airplane Co., Seattle, Wash.
TIME HISTORY SOLUTION PROGRAM, L225 (TEV126). VOLUME 1: ENGINEERING AND USAGE
R. I. Kroll, A. Tornallyay, and R. E. Clemmons Washington NASA Sep. 1979 105 p ref
(Contract NAS1-13918)
(NASA-CR-2859; D6-44468-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 01A

Volume 1 of a two volume document is presented. The usage of the convolution program L225 (TEV 126) is described. The program calculates the time response of a linear system by convoluting the impulsive response function with the time-dependent excitation function. The convolution is performed as a multiplication in the frequency domain. Fast Fourier transform techniques are used to transform the product back into the time domain to obtain response time histories. A brief description of the analysis used is presented. G.Y.

N79-32162*# Boeing Commercial Airplane Co., Seattle, Wash.
RANDOM HARMONIC ANALYSIS PROGRAM, L221 (TEV156). VOLUME 2: SUPPLEMENTAL SYSTEM DESIGN AND MAINTENENACE DOCUMENT
M. L. Graham, R. E. Clemmons, and R. D. Miller Washington NASA Sep. 1979 113 p refs
(Contract NAS1-13918)
(NASA-CR-2858; D6-44467-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 01A

Volume 2 of a two volume document is presented. A computer program, L221 (TEV 156), available for execution on the CDC 6600 computer is described. The program is capable of calculating steady-state solutions for linear second-order differential equations due to sinusoidal forcing functions. From this, steady-state solutions, generalized coordinates, and load frequency responses may be determined. Statistical characteristics of loads for the forcing function spectral shape may also be calculated using random harmonic analysis techniques. The particular field of application of the program is the analysis of airplane response and loads due to continuous random air turbulence. G.Y.

N79-32163*# Boeing Commercial Airplane Co., Seattle, Wash.
A PROGRAM TO COMPUTE THREE-DIMENSIONAL SUBSONIC UNSTEADY AERODYNAMIC CHARACTERISTICS USING THE DOUBLET LATTIC METHOD, L216 (DUBFLX). VOLUME 1: ENGINEERING AND USAGE Topical Report, May 1975 - May 1977
M. Richard and B. A. Harrison Washington NASA Oct. 1979 123 p refs
(Contract NAS1-13918)
(NASA-CR-2849; D6-44458-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 01A

The program input presented consists of configuration geometry, aerodynamic parameters, and modal data; output includes element geometry, pressure difference distributions, integrated aerodynamic coefficients, stability derivatives, generalized aerodynamic forces, and aerodynamic influence coefficient matrices. Optionally, modal data may be input on magnetic file (tape or disk), and certain geometric and aerodynamic output may be saved for subsequent use. M.M.M.

N79-32164*# Boeing Commercial Airplane Co., Seattle, Wash.
MODAL INTERPOLATION PROGRAM, L215 (INTERP). VOLUME 1: ENGINEERING AND USAGE Topical Report, May 1975 - May 1977
R. I. Kroll and M. Y. Hirayama Washington NASA Oct. 1979 121 p refs
(Contract NAS1-13918)
(NASA-CR-2847; D6-44456-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 01A

The usage of the Modal Interpolation Program L215 (INTERP) is described. The program uses modal data to form sets of arrays containing interpolation coefficients. The interpolation arrays can then be used to determine displacements at various aerodynamic surface and surface slopes that are parallel and perpendicular to the freestream direction. Five different interpolation methods are available. A description of the data manipulation and the interpolation methods is presented. G.Y.

N79-32165# ARO, Inc., Arnold Air Force Station, Tenn.
A CORRELATION OF ARTIFICIALLY INDUCED BOUNDARY-LAYER TRANSITION DATA FROM BLUNT SLENDER CONES AT HYPERSONIC SPEEDS Final Report, 13 Jul. - 16 Aug. 1978
A. H. Boudreau AEDC Jun. 1979 10 p refs
(AD-A070446; AEDC-TR-79-40) Avail: NTIS HC A02/MF A01 CSCL 16/4

Previous investigations of distributed-roughness boundary-layer trips indicated that they are superior to spherical-type trips in that equally effective distributed-roughness trips are one-fifth as high and produce substantially smaller flow-field disturbances. The present work has expanded the data base, permitting correlation of distributed roughness tripping data. The correlation thus developed includes a wide range of Reynolds numbers, cone angles, and trip heights. Plots are provided that permit the selection of distributed-roughness trips without the need of boundary-layer solutions. Author (GRA)

N79-32166# University of Southern California, Los Angeles. Dept. of Aerospace Engineering.
THE OBLIQUE WING AS A LIFTING-LINE PROBLEM IN TRANSONIC FLOW
H. K. Cheng and S. Y. Meng May 1979 114 p
(Contract N00014-75-C-0520; NR Proj. 061-192)
(AD-A070232; USCAE-53-4514-1541; USCAE-136) Avail: NTIS HC A06/MF A01 CSCL 20/4

A transonic-flow theory of thin oblique wing of high aspect ratio is presented, which permits a delineation of the influence of wing sweep, centerline curvature, and other three-dimensional (3-D) effects on the nonlinear mixed flow in the framework of an asymptotic theory. The component flow near the wing section is basically plane (two-dimensional) but nonlinear and mixed, being governed by equations consistent with the transonic small-disturbance approximation. The work analyzes 3-D corrections to this nonlinear problem and matching its solutions to that of a outer flow. In the (parameter) domain of interest, the outer solutions correspond to a high subsonic, or a linear sonic, outer flow, representable by a Prandtl-Glauert solution involving a swept (or curved) lifting line in the leading approximation. A procedure based on a line relaxation method for solving numerically the reduced inner problem is described; solutions with high subcritical, as well as slightly supercritical, component flows are demonstrated. Comparison with corresponding numerical solutions based on full-potential equations for oblique elliptic wing shows encouraging agreement. GRA

N79-32167# Aeronutronic Ford Corp., Newport Beach, Calif.
PRESSURE GRADIENT EFFECTS ON SUPERSONIC BOUNDARY LAYER TURBULENCE Final Technical Report, 30 Mar. 1977 - 30 Dec. 1978
A. J. Laderman Feb. 1979 179 p refs
(Contract F33615-77-C-3016; AF Proj. 2307)
(AD-A070254; U-6467; AFFDL-TR-79-3005) Avail: NTIS HC A09/MF A01 CSCL 20/4

Measurements of mean flow profiles at several streamwise locations in a supersonic turbulent boundary layer growing under a continuous adverse pressure gradient are reported. Tests were performed at a freestream Mach number of 3, for an adiabatic wall, using two curved ramps designed to produce constant pressure gradient flows. The velocity profile data, when transformed to incompressible coordinates, are in good agreement with Coles universal 'wall-wake' velocity profile and they indicate that the boundary layer is in local equilibrium and essentially independent of upstream history. In addition, the Coles wake parameters and Clauser shape factors, characterizing the transformed profiles, are in accord with the results of low speed correlations of adverse pressure gradient flows. The turbulent transport terms were extracted from the mean flow field data and indicate that for a given ramp, the profile of turbulent shear stress normalized by the wall shear, versus distance from the surface, normalized by the local boundary thickness, is severely distorted by the pressure gradient although it is apparently insensitive to local conditions. GRA

N79-32168# Tennessee Univ. Space Inst., Tullahoma.
SOME AERODYNAMIC PERFORMANCE CALCULATIONS ON MISSILE CONFIGURATIONS Final Report, 15 Jan. 1977 - 30 Nov. 1978
J. M. Wu, T. H. Moulden, K. Suryanarayanan, and N. Uchiyama May 1979 80 p refs
(Grant DAAG29-77-G-0108)
(AD-A070433; ARO-14966.2-AE) Avail: NTIS HC A05/MF A01 CSCL 20/4

Axisymmetric bodies with a clean configuration have a rather flat pressure distribution on the cylindrical portion of the body. In this report, axisymmetric bodies with surface cut outs are modelled using an inviscid flow approach with experimental flow results. Literature is available on numerical schemes for aerodynamic calculations on fins at moderately high angles of attack. Fin-body combinations are studied using a nose vortex model and some results reported. Also studied is the asymmetric nose vortex problem on an axisymmetric body at higher angles of attack. This has been studied for conical and ogive forebodies using a modified Wardlow's method. GRA

N79-32169# ARO, Inc., Arnold Air Force Station, Tenn.
HEAT-TRANSFER MEASUREMENTS ON A 5-DEG SHARP CONE USING INFRARED SCANNING AND ON-BOARD DISCRETE SENSOR TECHNIQUES Final Report
J. A. Noble and D. E. Boylan AEDC Dec. 1978 28 p refs
(AD-A070363; AEDC-TSR-78-V51) Avail: NTIS HC A03/MF A01 CSCL 14/2

Heat transfer data were obtained in hypersonic flow on a slender 5 deg half angle cone to evaluate the accuracy and test

procedure of an infrared thermal mapping technique. Data were also obtained using discrete on board meansurements for comparative purposes. GRA

N79-32170# Irvin Industries, Inc., Gardena, Calif.
RECOVERY SYSTEMS DESIGN GUIDE Final Technical Report, 1 Jun. 1975 - 30 Jun. 1978
E. G. Ewing, H. W. Bixby, and T. W. Knacke Wright-Patterson AFB AFFDL Dec. 1978 493 p
(Contract F33615-75-C-3081; AF Proj. 2402)
(AD-A070251; AFFDL-TR-78-157) Avail: NTIS HC A21/MF A01 CSCL 01/3

This document serves as the third revision of the USAF Parachute Handbook which was first published in 1951. The data and information represent the current state of the art relative to recovery system design and development. The initial chapters describe representative recovery applications, components, subsystems, material, manufacture and testing. The final chapters provide empirical data and analytical methods useful for predicting performance and presenting a definitive design of selected components into a reliable recovery system. GRA

N79-32171# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PREDICTION OF AERODYNAMIC FORCES ON A CIRCULAR CYLINDER AND A THIN AIRFOIL IN A TRANSONIC AIRSTREAM BY THE FINITE ELEMENT METHOD Ph.D. Thesis
James E. Marsh Mar. 1979 189 p refs
(AD-A070663; AFIT/DS/AA/79M-1) Avail: NTIS HC A09/MF A01 CSCL 20/4

The finite element method was used to solve the nonlinear, small-disturbance, transonic, velocity-potential equation for problems of steady flow over a circular cylinder and over a thin-airfoil in a uniform steady airstream. The governing differential equation is valid for inviscid, irrotational, isentropic flow of a perfect gas to include weak shocks providing airflow separation does not occur. For compressible subsonic and transonic flows the nonlinear small-disturbance equations was expressed in iterative form as a sequence of linear equations which was solved iteratively until the difference between two successive solutions became arbitrarily small. For analysis purposes, the infinite flowfield was replaced by a finite, but sufficiently large, domain that was discretized with sector elements for the cylinder problem and rectangular elements for the airfoil problem. The finite element equtions were obtained from Galerkin's Method of Weighted Residuals. Boundary conditions of the Neumann type were imposed along the surface contour of the cylinder and along an approximate boundary in accordance with classical thin-airfoil theory for the airfoil. For both problems Dirichlet conditions were imposed along the farfield boundary from an asymptotic solution which satisfies the actual infinity condition and is valid in the farfield. GRA

N79-32172# Calspan Advanced Technology Center, Buffalo, N. Y.
THEORETICAL STUDIES OF THREE DIMENSIONAL TRANSONIC FLOW THROUGH A COMPRESSOR BLADE ROW Annual Technical Report, 1 Apr. 1978 - 31 Mar. 1979
W. J. Rae 31 Mar. 1979 12 p refs
(Contract F49620-78-C-0057)
(AD-A071020; CALSPAN-6275-A-1; AFOSR-79-0805TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

Three dimensional flow effects play an important role in the performance of axial-flow fans and compressors that operate at transonic speeds. The coupling between transonic and three dimensional effects limits the applicability of the two dimensional analysis methods that have been in use for some years. The present research program was undertaken with the aim of extending these numerical techniques, so as to handle more fully the nonlinearity of the problem. Thus, heavily loaded blades with large turning angles are to be considered, and the simplifications of small-disturbance theory (such as satisfaction of boundary conditions on mean-chord surfaces, neglect of trailing vortex-sheet deformation) will not be used. GRA

N79-32173# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
AERODYNAMIC HEATING IN THE FIN INTERACTION REGION OF GENERALIZED MISSILE SHAPES AT MACH 6 (MODULAR MISSILE TEST PROGRAM) Final Report, Jul. 1974 - Apr. 1979
Richard D. Neumann and James R. Hayes May 1979 171 p refs
(AF Proj. 2404)
(AD-A071573; AFFDL-TR-79-3066) Avail: NTIS HC A08/MF A01 CSCL 20/4

The characteristics of three-dimensional shock wave turbulent boundary layer interactions are investigated for a finned ogive-cylinder configuration. An extensive experimental program was conducted in the AEDC/VKF Tunnel 'B' at Mach 6 and a unit Reynolds number of 4.9 million per foot. The model was an ogive-cylinder 50 inches long and 8.5 inches in diameter with fins mounted at model station 42. Heat transfer data were taken on the cylinder and on the fin surface in the interaction region of swept and unswept fins sealed to the cylinder and for a swept fin mounted on a torque tube. The objective of this effort was to correlate the peak interaction heating produced by missile control surfaces through extension of more geometrically simple concepts. Previous work reported for these more simple geometries is extended through this report to more practical configurations. The principle correlating parameter must be based on local flow properties which may be obtained from inviscid flow field computer program solutions. Extensive flow field probing of the shock layer on the ogive-cylinder alone was conducted and the results are shown to agree well with inviscid solutions. GRA

N79-32174# Analytical Methods, Inc., Bellevue, Wash.
HELICOPTER FLOW FIELD ANALYSIS Final Report, Apr. 1977 - Sep. 1978
David R. Clark, Frank A. Dvorak, Brian Maskew, T. Michael Summa, and Frank A. Woodward Apr. 1979 80 p refs
(Contract DAAJ02-77-C-0028)
(AD-A069542; USARTL-TR-79-4) Avail: NTIS HC A05/MF A01 CSCL 20/4

A computer program has been developed which allows the flow around general aircraft configurations to be modeled, including the effects of regions of separated flow. The program, although developed specifically to handle the regions of separated flow associated with the typically bluff helicopter airframes, retains the capability to model the more slender shapes associated with fixed-wing aircraft. The flow around the specified configuration is calculated iteratively, the first step being the solution of the basic potential flow. This is followed by the definition of the potential flow streamlines over the surface, the calculation of boundary layer growth along the streamlines, the identification of the separated flow region and the eventual recalculation of the potential flow, including the effects of boundary layer growth and separated flow. The iterations between potential and viscous flow may be repeated as often as desired. During its development, the program has been exercised on a number of helicopter and aircraft configurations. This experience has shown that the program can be used to model the flow about the involved shapes typical of the new generation of rotocraft now going into service without any increase in difficulty, either in preparing the input data or in executing the solution, when compared with earlier purely potential flow solutions. GRA

N79-32175# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
WINDTUNNEL MEASUREMENTS ON THE INTERFERENCE BETWEEN A JET AND A WING LOCATED OUTSIDE THE JET. PART 1: TEXT, TABLES, AND FIGURES
Y. G. Kho 9 Feb. 1979 93 p refs
(Contract NIVR-1761)
(NLR-TR-77009-U) Avail: NTIS HC A05/MF A01

A windtunnel investigation on the interference between a jet and a wing half model located outside the jet is described. Pressure distributions on the wing and lift coefficients calculated from then were used for evaluation of a method for the prediction of interference effects between jets and parts of airframes. A reduction of lift is found due to the jet below the wing, whereas the jet above the wing induces more lift, sometimes even leading

to early separation and stall. Also for comparison with calculated cross sectional jet areas, contours of the jet were estimated at two stations behind the nozzle exit. Author (ESA)

N79-32176# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.

CALCULATION OF THE FLOW AROUND A SWEPT WING, TAKING INTO ACCOUNT THE EFFECT OF THE THREE-DIMENSIONAL BOUNDARY LAYER. PART 2: WING WITH LAMINAR BOUNDARY LAYER ON THE LOWER SURFACE

B. vandenBerg, W. J. Piers, and E. deBoer 9 Feb. 1979 26 p refs

(Contract NIVR-1737)

(NLR-TR-77066-U) Avail: NTIS HC A03/MF A01

The attached flow around a swept wing was calculated with allowance for the effects of boundary layer and wake. Calculations for a swept wing with a laminar lower surface boundary layer were compared with experimental data. The comparison reveals that the viscous lift loss is less well predicted than for the case of a swept wing with a turbulent boundary on the upper and lower surface due to an existing uncertainty about the state of the lower surface boundary layer near the trailing edge.

Author (ESA)

N79-32177# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.

EXPERIMENTAL INVESTIGATION OF THE AERODYNAMIC CHARACTERISTICS OF A WING IN A JET FLOW

T. Zandbergen, R. A. Maarsingh, and C. J. J. Joosen 9 Feb. 1979 75 p refs

(Contract NIVR-1768)

(NLR-TR-77081-U) Avail: NTIS HC A04/MF A01

To test the qualities of the theoretical models used in two different calculation methods, pressure distributions were measured on a simple half-model wing-in-jet combination. The position of the jets relative to the wing was varied, mainly in a plane perpendicular to the span. Jet velocities of one, two, and three times the tunnel velocity were used. The wing model was used with and without a small, full-span auxiliary airfoil flap deflected at 30 deg. Results indicate that data from this test setup are appropriate for evaluating methods for calculating the distributed and total (integrated) lift on wings, and that a very complete picture of jet induced effects can be obtained.

Author (ESA)

N79-32178# Royal Aircraft Establishment, Bedford (England). Aerodynamics Dept.

AERODYNAMIC DATA FOR THREE SUPERCRITICAL AIRFOILS: RAE(NPL) 9515 AND 9530, AND RAE 9550. PARTS 1 AND 2

J. L. Fulker London Aeron. Res. Council 1978 153 p refs Previously announced as ARC-R/M-36198 and ARC-R/M-36262 (RAE-TR-74082 and RAE-TR-75068)

(ARC-R/M-3820; BR67756; ISBN-0-11-471153-4) Avail: NTIS HC A08/MF A01; HMSO £12

The experimentally determined aerodynamic characteristics of two 10.5% thick supercritical airflow sections, (RAE(NPL) 9515 and 9530) are compared, over the Mach number range 0.3 to 0.88 and with angles of incidence from -0.82 to 14. The corresponding results for RAE 9550, a 12.2% thick supercritical airfoil derived form an NLR shockless filting airfoil, from tests over the Mach number range 0.4 to 0.82 and with angles of incidence from 1 deg to 11 deg are given. The results are compared with theory and with the limited published results for an airfoil of a similar type. Author (ESA)

N79-32179# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.

WIND TUNNEL TESTS ON CAMBERED WINGS OF MILD GOTHIC PLANFORM. PART 1: FURTHER LOW SPEED TESTS. PART 2: TRANSONIC TESTS

P. J. Butterworth and P. Lee London Aeron. Res. Council Feb. 1978 113 p refs Previously announced as ARC-R/M-37556 and ARC-R/M-37523 (RAE-TR-77018 and RAE-TR-77006)

(ARC-R/M-3827; BR67755; ISBN-0-11-471160-7) Avail: NTIS HC A06/MF A01; HMSO £9

The low-speed, longitudinal characteristics were investigated for five cambered and two symmetric wings of mild gothic planform. These were designed, using a linear theory, for attached leading-edge flow at the low values of lift coefficient typical of the cruise of slender aircraft. The purpose of the investigation was to check that cambered wings designed in this way can produce, at the higher lift coefficients appropriate to take-off, substantial reductions in drag relative to a symmetric wing. The wings all had thickness/chord ratios of 0.09 or 0.004. The cambered wings were designed to have attached leading-edge flow at various values of lift coefficient and position of the center of pressure. The force-measurement and flow-visualization tests show that the design criteria were almost achieved, although inboard separations were observed under transition-free flow conditions. However, roughness bands applied near the leading edges suppressed these separations and the force results which are analyzed in detail were all obtained with boundary-layer transition fixed. Author (ESA)

N79-32180# National Aerospace Lab., Amsterdam (Netherlands). Div. of Fluid Dynamics.

THE DESIGN AND AERODYNAMIC CHARACTERISTICS OF AN 18% THICK SHOCK-FREE AIRFOIL (NLR 7501)

J. A. vanEgmond and D. Rozendal 5 Jun. 1978 27 p refs Presented at DGLR/GARTEUR 6 Symp. on Transonic Configurations, Bad Harzburg, West Germany, 13-15 Jun. 1978

(NLR-MP-78016-U) Avail: NTIS HC A03/MF A01

The design and experimental verification of a thick (18%), shock free airfoil is described. The design was performed using the hodograph theory for transonic airfoil design. The airfoil was experimentally investigated in a pilot tunnel. Off-design characteristics compare well with thinner airfoils. However, drag levels are much higher, mainly as a result of boundary layer separation at the trailing edge. Author (ESA)

N79-32181# National Aerospace Lab., Amsterdam (Netherlands). Div. of Scientific Services.

MULTI-ELEMENT AIRFOIL DESIGN BY OPTIMIZATION

T. E. Labrujere 19 Jun. 1978 10 p refs Presented at 11th ICAS Congr., Lisbon, Sep. 1978

(NLR-TR-78135-U) Avail: NTIS HC A02/MF A01

A method is presented for the design of multi-element airfoils in incompressible flow such that a priori specified aerodynamic and geometric requirements are fulfilled approximately. An object function is formed by summing the squared weighted deviations from the prescribed pressure distribution, zero normal velocity, and geometric conditions. Minimizing the object function results in the simultaneous determination for the shape of the airfoil and the real pressure distribution. Author (ESA)

N79-32182# Royal Aircraft Establishment, Farnborough (England).

MEASURED BLOCKAGE EFFECTS ON BLUFF BODIES IN CLOSED AND OPEN WIND TUNNELS

T. B. Owen London Dec. 1978 19 p refs Sponsored by Min. of Defence.

(RAE-TR-78151; BR67330) Avail: NTIS HC A02/MF A01

The base pressure of a series of square flat plates, placed normal to the airstream, was measured in three wind tunnels, two with a closed test section and one with an open test section. The measurements in the closed tunnels are in fair agreement with the theory due to Maskell which predicts a correction linearly dependent on C sub DxS/C. A correction of -0.2 x (the closed tunnel correction) is a fair approximation to the blockage effect in the open tunnel for C sub DxS/C $<$ 0.03 though, for larger blockage, a dependence on (C sub DxS/C) squared seems more appropriate. Author (ESA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N79-32183# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

FACTOR OF SAFETY - USAF DESIGN PRACTICE Final Report, Jan. - Sep. 1977
George E. Muller and Clement J. Schmid Apr. 1978 104 p refs Presented at the 45th Meeting of the Structures and Mater. Panel of AGARD, Voss Norway, 26 Sep. 1977
(AF Proj. 2401)
(AD-A070237; FFDL-TR-78-8) Avail: NTIS HC A06/MF A01 CSCL 01/2

A review of the historical development of the 1.5 structural factor of safety for airplanes, the 1.4 factor for manned space vehicles, and the 1.25 factor for missiles is presented from an Air Force perspective. Several variations and experimental applications of the factor of safety design concept and reliability based design concepts are also reviewed to show their interaction. Although not without criticism, the factor of safety design concept has become an almost universally accepted measure of flight safety. There is, however, a tendency among engineers to both challenge the continued application of factors of safety for efficient airframe design, and yet to avoid any changes that would challenge the confidence of future designs. The use of reliability based concepts will probably increase but their application to airframe design may be limited. The factor of safety still covers many contingencies and it appears at this time there will be a continuing need for some factor. GRA

N79-32184# Office of the Assistant Secretary for Policy, Plans and International Affairs (DOT), Washington, D. C. Office of Transportation Regulation.
TRENDS IN THE AIR SERVICE PROVIDED BY CERTIFICATED CARRIERS: 1938-1977 Final Report
Mar. 1979 221 p refs
(PB-295190/3; DOT-P-50-79-03) Avail: NTIS HC A10/MF A01 CSCL 01C

The air service provided in each state (excluding Alaska) is documented for every city, village or town which was ever part of an air carrier's certificate. Tables summarize (1) all points ever certificated; (2) the year of certification and deletion or suspension of certificated points; (3) those points which currently receive service; (4) the certificated monopoly points currently receiving service; (5) the method of abandonment for communities which no longer receive service by certificates carriers; and (6) points certificated and being served by trunk carriers and local service carriers, respectively, by state. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N79-32185*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COCKPIT DISPLAYS OF TRAFFIC INFORMATION: AIRLINE PILOTS OPINIONS ABOUT CONTENT, SYMBOLOGY, AND FORMAT
Sandra G. Hart (Tufts Univ., Medford, Mass.) and Thomas E. Wempe Aug. 1979 54 p refs
(NASA-TM-78601; A-7884) Avail: NTIS HC A04/MF A01 CSCL 17G

A number of candidate computer-generated cockpit displays of traffic information (CDTI) displays and display options were simulated statically and were shown to 23 airline pilots who were asked to respond to more than 250 questions about them. The pilots indicated that the amount and complexity of navigation information displayed should increase with altitude and map scale. Terrain information should appear automatically if a pilot's own aircraft descends below the minimum safe altitude and should include only those obstruction within 2,000 ft or less. Few pilots that weather information should be displayed on a CDTI, but if it was, it should be at pilot request only. A chevron-shaped symbol, located so that the majority of the map area was ahead was preferred. The position, altitude, ground speed, ground track, weight class, and flightpath history of other aircraft should be presented graphically by coding the shape of the symbol for other aircraft or presented digitally in data tags displayed at pilot request. All pilots thought that color coding was necessary to recognize different categories of information quickly and accurately. The majority of pilots felt that a CDTI would provide useful information even though its presence might increase their workload somewhat particularly during its introductory stages. A.R.H.

N79-32186# Melbourne Univ., Carlton (Australia). Coll. of Optometry.
RECOGNITION OF THE AIRCRAFT NAVIGATION LIGHT COLOUR CODE
K. J. Bowman and B. L. Cole Sep. 1979 69 p refs
Avail: NTIS HC A04/MF A01

The sources of visual information for determining the risk of collision were examined and it was found that the navigation light system can serve as a crude screening method enabling categorization of intruder aircraft into 'potential threat' and 'no threat' categories. It was noted that the minimum intensities for navigation signals afford only a limited visual range which might be further reduced by high intensity presence lights. However, it was also found that the fixity of bearing criterion has a number of shortcomings: it is invalid when either aircraft is changing course or speed and it may require a long pick-up range and lengthy periods of unwavering observation of the relative position of the intruder aircraft. An experiment is described which shows that observers with normal color vision are able to determine aircraft aspect and relative heading from the navigation light code with a moderately high degree of reliability. The reliability of judgement is decreased by higher intensity presence lights especially when they are located close to the navigation lights. R.E.S.

N79-32187# Army Communications Research and Development Command, Fort Monmouth, N. J.
PREDICTION OF TRANSIONOSPHERIC SIGNAL TIME DELAYS AT WIDELY SEPARATED LOCATIONS USING CORRELATIVE TECHNIQUES
H. Soicher May 1979 19 p refs
(AD-A070538; CORADCOM-79-2) Avail: NTIS HC A02/MF A01 CSCL 17/7

Excess time delays of transionospheric radio signals introduce ranging errors in satellite-navigation and radar systems, which are directly proportional to the total electron content (TEC) along the propagation path. Correlations of TEC values (based on linear regression analysis) at Fort Monmouth, N.J. (40.18 N, 74.06 W) and Richmond, Fl. (25.60 N, 80.40 W), as well as at Richmond, Fl. and Anchorage, Alaska (61.04 N, 149.75 W) were previously determined. The correlation analysis was performed at monthly and daily intervals for winter periods during the quiet phase of the solar cycle. Average regression lines obtained by the analysis were then used to try to determine TEC at Richmond, assuming the availability of TEC in Fort Monmouth, and at Anchorage, assuming the availability of TEC in Fort Monmouth, and at Anchorage, assuming the availability of TEC at Richmond. In most cases, the predicted TEC was within one standard deviation of actual observed data for the former case, and within two standard deviations for the latter case. GRA

N79-32188# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
THE EFFECTS OF THE TROPOSPHERE ON DOPPLER-NAVIGATED STATION POSITIONS
A. Eisner Dec. 1978 55 p refs
(Contract N00024-78-C-5384)
(AD-A070184; APL/JHU/TG-1323) Avail: NTIS HC A04/MF A01 CSCL 17/7

Ignoring the effect of the troposphere on Doppler data introduces 35 to 40 m errors in the navigated longitude of the Transit system user. Eliminating low elevation data (AN/BRN-3 strategy) reduces the errors by 70%. The BRN-3 software was modified to account for the troposphere using Black's analytic

form of Hopfield's tropospheric model. Two sets of fixes were done at the APL/JHU site. In the first set (39 passes), it was demonstrated that the neglected tropospheric effect had masked a 9 m error in station radius. For the non-troposphere-corrected case, the second set (115 passes) resulted in navigated longitudes for passes east and west of the station clustered on opposite sides of the 'true' longitude. The 29 m separation between the east and west clusters was reduced to 6.7 m by correcting the data for the effects of the troposphere. For the BRN-3 navigator at sea this represents, on the average, an 11 m reduction in longitude error. The implied consequences to the fixed site BRN-3 surveyor are a 2.2 m shift in mean latitude, a 0.7 m shift in the mean navigated longitude, a 0.7 m shift in the mean navigated longitude, and a 4.7 m reduction in the scatter of the mean navigated longitude. GRA

N79-32189# Army Training and Doctrine Command, Fort Monroe, Va.

NAVSTAR-GLOBAL POSITIONING SYSTEM (GPS) ARMY USER EQUIPMENT (AUE) REQUIRED OPERATIONAL CAPABILITY (ROC)

6 Apr. 1979 13 p

(AD-A070139) Avail: NTIS HC A02/MF A01 CSCL 17/7

A capability is needed for selected Army users to determine precise position and to navigate reliably worldwide under adverse weather, during day and night, in all climatic conditions, and in an Electric Warfare environment. The desired system must provide instantaneous position location information in Universal Transverse Mercator/Universal Polar Stereographic, Military Grid Reference System, grid coordinates and navigation information. The system should also provide a third dimension (altitude in MSL) in certain applications. Map, compass and conventional survey equipment in current use will not provide this location/navigation information to the degree of accuracy and responsiveness required to adequately support the combat user of fielded or emerging tactical systems. Planned systems are intended to provide capabilities to meet this need in general, but not all functional and operational elements can be efficiently supported by those systems being fielded or under development to date. Factors of tactical employment, geographical deployment, degrees of accuracy, and system capacity indicate the need for a mix of systems that can support all positioning and navigation requirements envisioned for the future. Author (GRA)

N79-32190# Sandia Labs., Albuquerque, N. Mex.

OPTIMAL TERRAIN-AIDED NAVIGATION SYSTEMS

L. D. Hostetler Jun. 1978 14 p refs Presented at Atmospheric Flight Mech. Conf., Palo Alto, Calif., 7 Aug. 1978

(Contract EY-76-C-04-0789)

(SAND-78-0874C; Conf-780814-3) Avail: NTIS HC A02/MF A01

The basic framework for applying Kalman filtering techniques to radar terrain-clearance data was investigated. By recursively Kalman processing each individual radar measurement separately, a whole new class of terrain-aided navigation schemes was developed. To diminish the effect of terrain nonlinearities, adaptive stochastic linearization techniques were utilized in a second-order filter formulation. As an application example results are presented indicating the performance improvements available through continuous terrain-aiding of an inertial, an air data, and a velocity sensing navigation system. DOE

N79-32191# National Aerospace Lab., Amsterdam (Netherlands). Scientific Services Div.

COMPARISON OF SOME METHODS TO DETERMINE THE DELAYS OF LANDING AIRCRAFT WITH RESPECT TO RUNWAY CAPACITY

M. vandenWilt 3 Mar. 1979 34 p refs

(NLR-MP-77028-U) Avail: NTIS HC A03/MF A01

The capacity of runways in use for landing aircraft can become the chief bottleneck as regards the capacity of airports. This runway capacity can result in long queues of aircraft waiting to land, which in turn results in unacceptable delays. Two analytic methods for determining these delays are described and the results are compared. The two methods differ in their modeling of the queueing system, which results in an optimistic and a pessimistic estimate of the delays. Finally, a model for Monte Carlo simulations is briefly described. The uncertainties in results obtained from this simulaton model are estimated. Author (ESA)

N79-32192# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

WIND SHEAR DURING APPROACH: AN INVESTIGATION INTO THE INFLUENCE OF A TOWER MEASURED WIND ENVIRONMENT ON THE SYMMETRIC MOTIONS OF A SIMULATED AIRCRAFT DURING AN AUTOMATIC APPROACH

J. Schurring 10 Apr. 1979 40 p refs

(Contracts RB-RLD-76008; RB-RLD-77007)

(NLR-TR-77078-U) Avail: NTIS HC A03/MF A01

Measured wind profiles from the Royal Netherlands Meteorological Institute 200 m meteorological tower at Cabauw were used to estimate wind shear effects on the symmetric motions of an approaching aircraft. Wind profiles as well as an automatically approaching DC-9 aircraft were simulated on an electronic analog computer. The study shows that requirements for autopilots, etc., specifying only mean shear values, like the 8 km/100 ft concept (FAA), are not adequate. Simulation results and measured wind data for the year 1973 were combined to obtain statistical information on the chance of exceeding a certain deviation from the glide path during an approach. The results indicate that relatively large deviations in the aircraft flight path are related to nightly stable meteorological conditions, with low wind speeds at height of 10 m, in particular from the east or south. The largest deviations produced by the Cabauw wind profiles for 1973 did not exceed the coverage of a normal I.L.S. glide path indicator. Severe storms did not present hazardous situations in terms of vertical wind shear. Author (ESA)

N79-32193# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

NAVAID CALIBRATION EVALUATION WITH A COMPUTER CONTROLLED AVIONICS DATA ACQUISITION SYSTEM

F. J. Abbink and R. Krijn 24 Aug. 1978 41 p refs Presented at 9th AIDS Symp. of the Deut. Studiengruppe fuer Flugdatensys. (DSF), Friedrichshafen, West Germany, 26-27 Sep. 1978

(NLR-MP-78030-U) Avail: NTIS HC A03/MF A01

To evaluate the applicability and accuracy of multi-distance measuring equipment (DME) positioning, a computer-controlled avionics-data acquisition system (CADAS) was developed. CADAS adaptively tunes the DME interrogator and acquires selected, time tagged data for recording on magnetic tape. With CADAS several multi-DME evaluation flights were executed. The results on the position accuracy and coverage of the multi-DME system are presented. This system was also used as a reference for the calibration of an Inertial Sensor System (ISS), VHF omnidirectional radio range (VOR) navigation beacons, and an air traffic control (ATC) radar. The results of these ISS calibration flights are presented. The measured errors are compared with the computed error variance obtained by the application of a covariance model and ISS component error variances. Furthermore, the VOR calibration results for various orbital and radial flights on standard and Doppler VORs are presented. The influence of the position where the VOR is calibrated as well as the possibility of calibrating multiple VORs on the same flight are investigated. Results of ATC radar power density measurement flights at various altitudes and flight tracks are given. Author (ESA)

N79-32194# Royal Aircraft Establishment, Farnborough (England).

TRIALS OF THE DOPPLER MICROWAVE LANDING SYSTEM AT LONDON (GATWICK) AIRPORT, AUGUST 1977

P. L. Gibson London Aug. 1977 83 p refs Sponsored by Min. of Defence.

(RAE-TR-78124; BR66981) Avail: NTIS HC A05/MF A01

The trials of the Doppler microwave landing system (DMLS) at Gatwick formed part of a series conducted at operational airports to collect data for the ICAO evaluation program. Typical data collected from the trials at Gatwick and analysis of the results show that DMLS met the performance requirements at this airport for line of sight propagation paths. No specific technique related effects were seen and the results are regarded as typical of C band MLS performance at this airport. Author (ESA)

N79-32195# Royal Aircraft Establishment, Farnborough (England).
TRIALS OF THE DOPPLER MICROWAVE LANDING SYSTEM AT MANCHESTER INTERNATIONAL AIRPORT, OCTOBER/NOVEMBER 1977
D. Walker London 1977 130 p refs Sponsored by Min. of Defence
(RAE-TR-78144; BR67351) Avail: NTIS HC A07/MF A01

Tests performed at Manchester to determine the multipath environment are described. High levels of azimuth system multipath were found close to the runway threshold but azimuth systems with as small an aperture as 20 wavelengths (1.2 m) gave the equivalent of ILS Category 3 accuracy. No isolated sources of elevation multipath were found and a 39 wavelength aperture system (2.3 m) gave the equivalent of ILS Category 3 accuracy for 3 deg approaches. The coverage requirement of 20 n mile range and + or - 40 deg azimuth was achieved at heights sufficient to give clear line of sight, but at elevation angles below about 1.5 deg shadowing caused signal loss and large errors. Autolands were demonstrated using the 54 wavelength aperture systems. No specifically technique related effects were seen and the results are regarded as representative of typical C-band MLS performance. Author (ESA)

N79-32196# Transportation Systems Center, Cambridge, Mass.
THE COSTS AND BENEFITS OF A MID-CONTINENT EXPANSION OF LORAN-C Final Report
R. L. Wiseman and C. M. Veronda Mar. 1979 177 p refs
(PB-294614/3; DOT-TSC-RSPA-79-3) Avail: NTIS HC A09/MF A01 CSCL 17G

The public benefits of a limited number of potential land applications of Loran-C are presented. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N79-32197*# Rockwell International Corp., Los Angeles, Calif.
HiMAT STRUCTURAL DEVELOPMENT DESIGN METHODOLOGY
M. A. Price Oct. 1979 234 p refs
(Contract NAS4-25600)
(NASA-CR-144886) Avail: NTIS HC A11/MF A01 CSCL 01C

In order to improve aerodynamic performance, a twist criterion was used to design the canard and wing lifting surfaces of two graphite-epoxy research aircraft. To meet that twist criterion, the lifting surfaces were tailored using graphite-epoxy tape. The outer surface of the aircraft is essentially constructed of 95 percent graphite epoxy materials. The analytical tools and methodology used to design those lifting surfaces are described. One aircraft was subjected to an 8g ground test in order to verify structural integrity and to determine how well the desired twist was achieved. Test results are presented and the reductions of both flight and ground strain test gages and their associated stresses are discussed. A.R.H.

N79-32198# Systems Technology, Inc., Mountain View, Calif.
POWERED-LIFT AIRCRAFT HANDLING QUALITIES IN THE PRESENCE OF NATURALLY-OCCURRING AND COMPUTER-GENERATED ATMOSPHERIC DISTURBANCES Final Report, 11 May 1977 - 26 Apr. 1979
Wayne F. Jewell, Warren F. Clement, Thomas C. West (FAA, Washington, D. C.), and S. R. M. Sinclair May 1979 86 p refs Prepared in cooperation with National Aeronautical Establishment, Ottawa (Ontario)
(Contract DOT-FA77WA-3936)
(AD-A072118; FAA-RD-79-59; STI-TR-1099-3) Avail: NTIS HC A05/MF A01 CSCL 01/2

The handling quality assessments obtained in the airborne and ground-based simulators were similar, but wind shear was responsible for more of the differences than turbulence. The comparison of the handling quality assessments and selected measures of combined pilot-vehicle performance obtained with the naturally occurring and computer generated turbulences demonstrate that the Dryden model can yield optimistic ratings of airplane handling qualities and an optimistic estimate of combined pilot-vehicle performance degradation in turbulent landing conditions. M.M.M.

N79-32199# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
PRELIMINARY AIRWORTHINESS EVALUATION CH-47C WITH FIBERGLASS ROTOR BLADES WITH T55-L-712 ENGINES Final Report
Sherwood C. Spring, John R. Niemann, and Grady W. Wilson Apr. 1979 79 p
(AD-A069891; USAAEFA-77-31) Avail: NTIS HC A05/MF A01 CSCL 01/3

A Preliminary Army Evaluation of a CH-47C helicopter equipped with Fiberglass rotor blades was flown from 31 October through 7 November 1978. A total of 22 hours, 13 of which were productive, was required. Tests were conducted at the Boeing Vertol test facility at Wilmington, Delaware. Fiberglass rotor blades at a rotor speed of 225 rpm have improved hover performance in terms of decreased power required when compared to metal blades at the operating rotor speeds of 235 and 245 rpm. There is an improvement in level flight performance in terms of a reduction in power required between fiberglass blades at a rotor speed of 225 rpm compared to metal blades at a rotor speed of 245 rpm. Handling qualities, for all conditions tested, were essentially the same as with metal rotor blades and are satisfactory. Five shortcomings were identified, only two of which were related to the fiberglass rotor blades. The fiberglass blade related shortcomings were (1) the high six-per-rotor-revolution (6/rev) (22.5 Hz) vibration levels in the vicinity of the cargo hatch and ramp area at light gross weight and airspeeds of 100 knots calibrated airspeed (KCAS) and above; and (2) high vibration levels (3 and 6/rev) throughout the aircraft at airspeeds of 140 KCAS and above. The other shortcomings are standard CH-47C problems that remain unchanged with fiberglass rotor blades and were associated with excessive cabin noise levels, lack of adequate intercom/radio audio gain when using earplugs and poor power management characteristics. GRA

N79-32200# Boeing Aerospace Co., Seattle, Wash.
THE TRANSONIC OSCILLATING FLAP Final Report, Apr. - Sep. 1978
Wilson C. Chin May 1979 21 p refs
(Contract N00014-78-C-0349)
(AD-A070022; D180-25330-1) Avail: NTIS HC A02/MF A01 CSCL 20/4

Numerical experiments for the unsteady transonic flow past a symmetric airfoil with an oscillating flap in free air are carried out for a range of supercritical Mach numbers and reduced frequencies using two newly devised computational schemes. The inviscid results, unhampered by the complicating effects of wind tunnel wall interference and shockwave and boundary layer interaction, evaluate the extent to which the unsteady loading responds linearly to changes in flap deflection and also the dependence of shock excursion amplitude and net unsteady lift and moment coefficients on oscillation frequency. The main conclusions are discussed in light of recent experimental findings. GRA

N79-32201# Battelle Columbus Labs., Ohio.
COLLECTED ENGINEERING DATA SHEETS, AIR FORCE DATA SHEET PROGRAM Final Report, Apr. 1965 - Sep. 1978
Omar Deel Wright-Patterson AFB AFML Dec. 1978 524 p
(Contract F33615-77-C-5009; AF Proj. 7381)
(AD-A070665; AFML-TR-78-179) Avail: NTIS HC A22/MF A01 CSCL 11/6

The major objectives of this program were to evaluate newly developed materials of interest to the Air Force for potential airframe structural usage, and to provide 'data sheet' type presentations of engineering data for these materials. This report presents a collection of all of the data sheets generated to date on the Air Data Sheet Program. GRA

N79-32202# Boeing Aerospace Co., Seattle, Wash.
TRANSONIC WING REDESIGN USING A GENERALIZED FICTITIOUS GAS METHOD Final Report, Oct. 1978 - May 1979
N. Yu and P. E. Rubbert May 1979 35 p refs
(Contract N00014-78-C-0349)
(AD-A070013; D-180-25309-1) Avail: NTIS HC A03/MF A01 CSCL 20/4

A numerical method for transonic shock-free or nearly shock-free airfoil and wing redesign based on the full potential equation is presented. The method utilizes a generalized fictitious gas approach wherein a variety of parameters controlling the character of the fictitious gas laws are introduced to provide a degree of control over the redesigned upper surface geometry and the pressure distribution of the redesigned shape. Results for a redesigned advanced airfoil as well as a three-dimensional wing are illustrated. Significantly improved aerodynamic characteristics are achieved through the present redesigned technique.
GRA

N79-32203# Southwest Research Inst., San Antonio, Tex.
EXPERIMENTAL METHODS FOR AIRCRAFT DESIGN QUALIFICATIONS IN AN EXPLODING WARHEAD ENVIRONMENT Final Report, Jul. 1977 - Oct. 1978
E. D. Esparza Feb. 1979 72 p
(Contract DAAK11-77-C-0043)
(AD-A070381; AFFDL-TR-79-3008) Avail: NTIS HC A04/MF A01 CSCL 01/3

An experimental program was performed to investigate the effect of high-velocity fragments alone and coupled with a blast pressure to determine whether accurate simulation testing of aircraft fuel tanks in a near-miss exploding warhead environment must include the blast threat. A series of tests was conducted to synchronize the fragments and blast pressure loading. Experiments were then conducted using a simulated fuel tank which included replaceable front and rear walls. The fuel tank, empty and full of water, was tested with five steel rectangular prism fragments alone, and the combination of the same fragments with a blast pressure wave of similar magnitude and duration as would be generated by an exploding warhead. Four types of aluminum front panels were tested using two types of aluminum and two thicknesses of each. The rear panel used on the full tank tests was the same for all these tests. The report presents the complete experimental program, a description of the test facilities, the simulation techniques and the instrumentation used in the program. Structural damage of the test panels are depicted by photographs of each panel. The results indicate that the addition of blast pressure can definitely enhance the fragment damage to the panels, particularly with an empty fuel tank. GRA

N79-32204# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
QUALIFICATION TESTS FOR HELICOPTERS TO BE USED ON BOARD SHIPS
T. Hoekstra, R. Fang, C. Leijnse, and L. T. Renirie 17 Aug. 1978 21 p Presented at Europort Naval Conf., Amsterdam, 14-17 Nov. 1978
(NLR-MP-78032-U) Avail: NTIS HC A02/MF A01

Although helicopter manufacturers usually define limits for the safe operation of a helicopter, they generally apply to a rigid platform situation only. For operations involving ships, additional limitations must be observed. The requirement for the development of adapted operation procedures for helicopters and the determination of new limitations to ensure optimum use and adequate safety are discussed. The relevant test procedure is described. It is shown that, despite certain difficulties related to the kinds of tests, the desired objective can be attained.
Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N79-32205*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LOW-COST INERTIAL NAVIGATION FOR MODERATE-g MISSIONS
Shmuel Merhav Sep. 1979 61 p refs
(NASA-TM-78611; A-7920) Avail: NTIS HC A04/MF A01 CSCL 01D

A low cost inertial navigation system (INS) concept is described for flight missions characterized by moderate accelerations and limited attitude variations. These missions involve general aviation aircraft, helicopters, or remotely piloted vehicles. The significance of the moderate acceleration and limited attitude is reviewed with respect to platform mechanization and instrumentation. A hybrid mechanixation, partially gimballed and partially strapdown, is presented. The INS is implemented by an unbalanced two axis gimbal system and controlled by a two degree of freedom gyro. The INS provides locally level two axis acceleration information along with pitch and roll measurements. Heading information is provided by a second gyro mounted in the inner gimbal. The system error model is equivalent to that of a conventional platform with a tilt error determined by the integral of the gyro drift rate and an equivalent accelerometer type errors are also cancelled. Rapid gyro-compassing, implemented with opened gimbal control loops, and a strapdown procedure provides calibration of gyro drift rate biases. A.W.H.

N79-32206# Arinc Research Corp., Annapolis, Md.
AVIONICS COST DEVELOPMENT FOR USE OF LORAN-C NAVIGATION SYSTEMS BY LOW PERFORMANCE GENERAL-AVIATION AIRCRAFT Final Report
S. H. Kowalski Apr. 1979 26 p refs
(Contract DOT-FA76WA-3788)
(AD-A068268; Rept-1326-01-8-1906) Avail: NTIS HC A03/MF A01 CSCL 17/7

This avionics cost study of the Long-Range Navigation (LORAN-C) system used by low-performance general-aviation aircraft, performed for the Federal Aviation Administration (FAA) Office of Systems Engineering Management (OSEM), was based on a uniform approach to cost estimating with the assistance of a pricing model. The system evaluated is the Teledyne TDL-711 LORAN Micro-Navigator, with appropriate design and packaging modifications to meet the less stringent environmental and packaging requirements of general aviation. The LORAN-C system in its airborne configuration requires a receiver, a control and display unit, and an antenna with a built-in coupler. The expected costs of the avionics required by single and light-twin-engine aircraft were developed by using a parametric cost-estimating model. These costs, shown in Table S-1, are in 1977 dollars, without inflation, and are based on annual production quantities of 1,000 units. Development costs were amortized over a 3,000 - unit production quantity. The 1977 dollars were used to facilitate comparison with other cost results of alternative navigation systems previously evaluated by ARINC Research for the FAA.
GRA

N79-32207# Army Missile Research and Development Command, Redstone Arsenal, Ala. Guidance and Control Directorate.
FLIGHT TEST RESULTS OF A VIRTUAL IMAGE, PANTOGRAPH MOUNTED, CONTROL AND DISPLAY STATION
Michael C. Pitruzzello 23 Feb. 1979 19 p
(AD-A070290; DRDMI-T-79-33) Avail: NTIS HC A02/MF A01 CSCL 19/5

A growing number of US Army programs requires target detection and identification at long stand-off-ranges from airborne (helicopter) platforms. One method that is currently being pursued to meet this requirement is to provide the helicopter gunner with a precision stabilized optical or electro-optical sighting system. Unfortunately, the required optical magnification requires a small angular field-of-view. This can result in excessive target search times during which the helicopter may be vulnerable to enemy fire.
Author (GRA)

N79-32208# National Oceanic and Atmospheric Administration, Miami, Fla. Facilities Research Center.
RECORD KEEPING ON AIRCRAFT INSTRUMENTS
Heinz H. Grote Dec. 1978 79 p

(PB-295698/5; NOAA-TM-ERL-RFC-2; NOAA-79041204) Avail: NTIS HC A05/MF A01 CSCL 01D

The record keeping process for aircraft instruments and their use, calibration, and repair is described. Computer techniques are discussed and sample computer programs are appended.

GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N79-32209 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

AN INVESTIGATION OF FLAME STABILITY IN A COAXIAL DUMP COMBUSTOR Ph.D. Thesis

Edward Thomas Curran 1979 235 p

Avail: Univ. Microfilms Order No. 7920915

An experimental investigation of the flame stability characteristics of a coaxial dump combustion chamber was made. A derived correlating parameter was used to obtain successful correlations. The dominant variable in flame stability was the inlet temperature; the subsidiary variables were the step height, inlet pressure, and velocity. The effect of velocity on the lean extinction limit was very small. With JP-4 fuel the existence of complete stability loops was demonstrated by operating at very low combustor pressures. Tests were performed using a transparent quartz combustor; it was observed that the combustion process was an oscillatory phenomenon with the reaction zone moving rapidly to and fro along the combustor. Dissert. Abstr.

N79-32210*# Joint Inst. for Advancement of Flight Sciences, Hampton, Va.

ACOUSTIC ANALYSIS OF THE PROPFAN Final Report

F. Farassat (George Washington Univ.) and G. P. Succi (MIT) 1979 42 p refs

(Contract NAS1-15154; Grant NsG-1474)

(NASA-CR-162312) Avail: NTIS HC A03/MF A01 CSCL 21E

A review of propeller noise prediction technology is presented. Two methods for the prediction of the noise from conventional and advanced propellers in forward flight are described. These methods are based on different time domain formulations. Brief descriptions of the computer algorithms based on these formulations are given. The output of the programs (the acoustic pressure signature) was Fourier analyzed to get the acoustic pressure spectrum. The main difference between the two programs is that one can handle propellers with supersonic tip speed while the other is for subsonic tip speed propellers. Comparisons of the calculated and measured acoustic data for a conventional and an advanced propeller show good agreement in general. R.E.S.

N79-32211*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

LEAN, PREMIXED, PREVAPORIZED FUEL COMBUSTOR CONCEPTUAL DESIGN STUDY Final Report

A. J. Fiorentino, W. Greene, and J. Kim Washington NASA Aug. 1979 63 p refs

(Contract NAS3-21256)

(NASA-CR-159647; PWA-5626-12) Avail: NTIS HC A04/MF A01 CSCL 21E

Four combustor concepts, designed for the energy efficient engine, utilize variable geometry or other flow modulation techniques to control the equivalence ratio of the initial burning zone. Lean conditions are maintained at high power to control oxides of nitrogen while near stoichometric conditions are maintained at low power for low CO and THC emissions. Each concept was analyzed and ranked for its potential in meeting the goals of the program. Although the primary goal of the program is a low level of nitric oxide emissions at stratospheric cruise conditions, both the ground level EPA emission standards and combustor performance and operational requirements typical of advanced subsonic aircraft engines are retained as goals as well. Based on the analytical projections made, two of the concepts offer the potential of achieving the emission goals; however, the projected operational characteristics and reliability of any concept to perform satisfactorily over an entire aircraft flight envelope would require extensive experimental substantiation before engine adaptation can be considered. A.R.H.

N79-32212*# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering and Applied Mechanics.

FLOW IN NONROTATING PASSAGES OF RADIAL INFLOW TURBINES

E. Baskharone, A. Hamed, and W. Tabakoff Sep. 1979 104 p refs

(Grant NsG-3066)

(NASA-CR-159679) Avail: NTIS HC A06/MF A01 CSCL 21E

The analysis of irrotational incompressible flow field in the stator unit of a radial inflow turbine is presented. The solution in the combined scroll-nozzle assembly is complicated by the domain geometry and by its multiconnectivity. This model is necessary, however, in order to provide a better understanding of the mutual interaction effects of these two components on the flow field. The finite element method is used in the solution which is limited to the two dimensional case. A substructuring technique is adopted in the computational procedure and results in considerable savings in both computer time and core storage requirements. The results are presented for the flow velocity magnitude and direction in the scroll and through the various nozzles, for two nozzle blade geometries. In addition, the mass flow rates in the different nozzles are computed and their deviations from the mean value determined. Author

N79-32213*# M&S Computing, Inc., Huntsville, Ala.

STANDALONE ENGINE SIMULATOR (SAES), ENGINE DYNAMICS SIMULATOR (EDS) XEROX SIGMA 5 INTERFACE HARDWARE MANUAL

Philip M. Kirshten, Schelly Black, and Ray Pearson 17 Jul. 1979 111 p refs

(Contract NAS8-33244)

(NASA-CR-161301; Rept-78-113) Avail: NTIS HC A06/MF A01 CSCL 21E

The ESS-EDS and EDS-Sigma interfaces within the standalone engine simulator are described. The oepration of these interfaces, including the definition and use of special function signals and data flow paths within them during data transfers, is presented along with detailed schematics and circuit layouts of the described equipment. A.W.H.

N79-32214# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

HANDLING PROBLEMS RESULTING FROM COMPRESSOR DETERIORATION

J. P. K. Vleghert 6 Jun. 1978 11 p Presented at AGARD Propulsion and Energetics Panel Symp. on Stresses, Vibration Structural Integration and Engine Integrity, Cleveland, 23-27 Oct. 1978

(NLR-MP-78019-U) Avail: NTIS HC A02/MF A01

The Royal Netherlands Air Force has experienced performance loss and increased rate of inflight compressor stalls due to compressor deterioration on some of their 15 year old engines. Investigations on the Maintenance Depot test bed showed that significant loss of air mass flow occurred near the surge line under conditions which were not covered by the normal post-overhaul acceptance tests. It was also found that impending stall was always produced by increasing pressure fluctuations, although the level of these pressure fluctuations varied with different engines. A method was developed to routine check for this phenomenon. The surge margin of the affected engines was recovered by replacing the rear compressor casing. Further investigation, conducted by the engine manufacturer to narrow down the reason for the engine's behavior, is discussed.

Author (ESA)

N79-32215# United Technologies Research Center, East Hartford, Conn.
WATER-COOLED TURBINE BLADE TECHNOLOGY STUDY Final Report, 1 Jun. 1975 - 31 May 1978
B. V. Johnson Jan. 1979 110 p refs
(Grant NSF AER-75-08809)
(PB-295892/4; R78-912176-7; NSF/RA-790023) Avail: NTIS HC A06/MF A01 CSCL 21E

Combined free- and forced-convection heat transfer data applicable to the design of coolant passage geometries for turbine blades cooled with supercritical pressure water was obtained to determine what benefits in cycle efficiency and performance could be obtained with water-cooled gas turbine blades. Results for both types of cycles indicated that absolute efficiencies 1 to 3 percentage points greater and power output per unit airflow 5 to 25 percent greater could be obtained from turbines using water-cooled blades as opposed to air-cooled blades. Preliminary thermal and stress analysis of candidate blade configurations were conducted for selected gas turbine operating conditions to guide the selection of the operating conditions for the heat transfer experiments. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N79-32216# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.
AIRCRAFT DESIGN LOADS DUE TO NON-STATIONARY ATMOSPHERIC TURBULENCE PATCHES
R. Noback 27 Jun. 1978 90 p refs
(Contract NIVR-1775)
(NLR-TR-78073-U) Avail: NTIS HC A05/MF A01

It is assumed that atmospheric turbulence appears in patches and that within the patches the turbulence can be described as a modulated Gaussian process. The patch lengths are shown to have a certain probability density function. Load excedance curves and design loads for various aircraft models using this turbulence model are compared with those obtained with the power spectral density (PSD) turbulence model. Results show that the PSD model is more powerful than the underlying assumptions suggest and that it should continue to be used for the establishment of design loads, as its application is less complicated, even though the modulated Gaussian turbulence patch model gives a better description of atmospheric turbulence. Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N79-32217*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SAFETY SHIELD FOR VACUUM/PRESSURE CHAMBER VIEWING PORT Patent Application
Richard A. Shimansky and Rodney S. Spencer, inventors (to NASA) Filed 29 Jun. 1979 12 p
(NASA-Case-GSC-12513-1; US-Patent-Appl-SN-053571) Avail: NTIS HC A02/MF A01 CSCL 14B

An optically clear safety shield, formed from a plate of Plexiglas, is mounted in a spaced-apart relationship from the viewing port on the outer surface of a vacuum or high pressure chamber. Because of the air gap between the viewing port and the safety shield, the shield is not subject to the cyclic stresses placed on the viewing window which tend to make it fail. Flying debris from a shattered viewing port window is deflected by the safety shield away from personnel and instruments in the vicinity of the chamber. NASA

N79-32218# Naval Civil Engineering Lab., Port Hueneme, Calif.
RECYCLING OF ASPHALT CONCRETE AIRFIELD PAVEMENT: A LABORATORY STUDY Final Report, Jan. 1977 Dec. 1978
R. B. Brownie and M. C. Hironaka May 1979 135 p refs
(Contract DOT-FA77WAI-704)
(AD-A072117; FAA-RD-78-58) Avail: NTIS HC A07/MF A01 CSCL 13/2

Aged asphalt concrete (AC) pavement samples, obtained from three Naval airfields and two civil airports, were used in laboratory experiments to develop and establish criteria and design guidelines for recycling such pavements. Tests were conducted on nine agents for softening residual asphalt cements and designed hot- and cold-mix samples. It was found that aged AC pavement materials can be recycled to meet FAA and Navy specifications for new pavement surfaces and base courses by hot-mix recycling procedures and new base courses by cold-mix recycling procedures. Based on the results of this investigation, criteria and design guidelines for recycling aged AC pavements by hot-mix and cold-mix procedures were established. A.R.H.

N79-32219*# Lockheed-Georgia Co., Marietta.
ESTIMATION OF TUNNEL BLOCKAGE FROM WALL PRESSURE SIGNATURES: A REVIEW AND DATA CORRELATION
J. E. Hackett, D. J. Wilsden, and D. E. Lilley Mar. 1979 170 p refs
(Contract NAS2-9883)
(NASA-CR-152241) Avail: NTIS HC A08/MF A01 CSCL 14B

A method is described for estimating low speed wind tunnel blockage, including model volume, bubble separation and viscous wake effects. A tunnel-centerline, source/sink distribution is derived from measured wall pressure signatures using fast algorithms to solve the inverse problem in three dimensions. Blockage may then be computed throughout the test volume. Correlations using scaled models or tests in two tunnels were made in all cases. In many cases model reference area exceeded 10% of the tunnel cross-sectional area. Good correlations were obtained regarding model surface pressures, lift drag and pitching moment. It is shown that blockage-induced velocity variations across the test section are relatively unimportant but axial gradients should be considered when model size is determined. M.M.M.

N79-32220# ARO, Inc., Arnold Air Force Station, Tenn.
A VORTEX LATTICE TECHNIQUE FOR COMPUTING VENTILATED WIND TUNNEL WALL INTERFERENCE Final Report, Jan. 1976 - Sep. 1977
F. L. Heltsley and W. E. Dietz, Jr. AEDC Jun. 1979 30 p refs
(AD-A070445; AEDC-TR-79-21) Avail: NTIS HC A03/MF A01 CSCL 14/2

A vortex lattice method has been applied to the problem of predicting the interference induced by ventilated wind tunnel walls. The formulations of both perforated and slotted wall boundaries using the vortex lattice method are presented. Wall interference effects on a single lifting line vortex for several basic wind tunnel test section configurations are compared with other theoretical results. Use of the vortex lattice method to calculate the aerodynamic characteristics of a lifting model too complex for exact analytical treatment is discussed. The surface pressure distribution on a combined wing and tail representation computed for a free stream is presented as well as those for both closed and slotted test sections to illustrate the capability of the technique. GRA

N79-32221# ARO, Inc., Arnold Air Force Station, Tenn.
TUNNEL 16T PERFORMANCE: TWO-AND THREE-STAGE COMPRESSOR PERFORMANCE Final Report
J. A. Reed AEDC 21 Feb. 1979 32 p
(AD-A070191; AEDC-TSR-79-P10) Avail: NTIS HC A03/MF A01 CSCL 14/2

PWT Tunnel 16T compressor, C1, was operated in a two-stage configuration for the purpose of validating computer predicted

results obtained with the COCODEC compressor code. The third rotor row of the three-stage machine was removed and an aluminum shroud was installed to provide a smooth flow passage over the voids created by the blade removal. The compressor was reconfigured to three stages and a verification run was made to ensure that no changes in the compressor performance had occurred during the two-stage modification and the reinstallation of the third rotor row. GRA

N79-32222# Calspan Corp., Buffalo, N. Y.
SURVEY AND EVALUATION OF POTENTIAL REAL-TIME INTERACTIVE FLIGHT TEST FACILITIES FOR THE B-1
W. Deazley and W. Shed 5 Jan. 1973 45 p
(Contract F33657-71-C-1055)
(AD-A070343; CALSPAN-BA-3103-N-101) Avail: NTIS HC A03/MF A01 CSCL 01/3

Real-time or real-time interactive flight testing (or displays) is the use of rapidly processed flight test data displayed in a form most effective for engineering evaluation or analysis at a rate permitting interaction between engineering personnel on the ground and the pilot in the test aircraft. The time delays involved in making the computations and absorbing the meaning of the displayed results of a particular test must be small enough to allow the engineer to communicate his satisfaction or concerns to the flight test controller and the pilot soon enough to permit re-testing, modifications, omission of the next step, or proceeding as planned. Typical delays of 1 or 2 minutes could probably be tolerated. GRA

N79-32223# ARO, Inc., Arnold Air Force Station, Tenn.
AN EXPERIMENTAL INVESTIGATION OF THE ACOUSTIC CHARACTERISTICS OF A VARIETY OF SLOT BAFFLE CONFIGURATIONS FOR TRANSONIC WIND TUNNEL WALLS Final Report, 1 Jul. 1976 - 30 Sep. 1977
N. S. Dougherty, Jr. AEDC Jun. 1979 73 p refs Sponsored by the Air Force
(AD-A070261; AEDC-TR-79-16) Avail: NTIS HC A04/MF A01 CSCL 20/4

A parametric study of various slot baffle geometric configurations was performed in an effort to find an improvement to the acoustic characteristics of baffled slotted walls used in the NASA/Ames Research Center transonic wind tunnels. The desired improvement was to reduce the aerodynamic noise generated by these walls. Parameters studied were baffle inclination angle, shape, and depth. A modification to wall samples which effectively suppressed the noise generated by the baffled slots was a fine-mesh wire screen overlay in combination with baffle inclination angle. The degree of tunnel was noise suppression achieved in the experiments was a factor of six less than the configuration now in use. Author (GRA)

N79-32224# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CONSTRUCTION PROBLEMS FOR HIGH REYNOLDS NUMBER WIND TUNNEL MODELS
Maurice Bazin 1978 36 p refs In FRENCH; ENGLISH summary Presented at 14th Colloq. d'Aerodyn. Appl. de l'Assoc. Aeron. et Astron. de France, Toulouse, 7-9 Nov. 1977 Report will also be announced as translation (ESA-TT-564)
(ONERA-NT-1978-6) Avail: NTIS HC A03/MF A01

The choice of materials, the structural design of the model and of removable or motorized elements as well as problems of definition are presented. Models for weighings and determining pressure distribution along with models of air intakes, of jet simulation, and dynamic flutter models are considered. The model definition and machining, relative to time and cost constraints that entail new construction methods, are discussed. It is shown that deformations in operation, under the effect of aerodynamic and thermal loads, require the implementation of new measuring techniques. The capacity, thermal protection, and calibration methods of the balances also have to be adapted. The mechanical strength of the supports, in particular regarding the risk of divergence, and the dynamic behavior of the mountings are the most severe limitations in the use of pressurized wind tunnels. Thermal effects are added in a cryogenic environment. These effects concern instrumentation considered and the evolution of detectors as well as of pressure measurement methods and instruments is considered. Author (ESA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N79-32225*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE RESOURCES AND SPACE SETTLEMENTS
John Billingham, ed., William Gilbreath, ed., Brian OLeary, ed. (Princeton Univ.), and Beulah Gosset, ed. Washington 1979 292 p Derived from 1977 Ames Summer Study, Moffett Field, Calif. Original contains color illustrations
(NASA-SP-428) Avail: NTIS MF A01; SOD HC CSCL 22B

The technical papers from the five tasks groups that took part in the 1977 Ames Summer Study on Space Settlements and Industrialization Using Nonterrestrial Materials are presented. The papers are presented under the following general topics: (1) research needs for regenerative life-support systems; (2) habitat design; (3) dynamics and design of electromagnetic mass drivers; (4) asteroids as resources for space manufacturing; and (5) processing of nonterrestrial materials. For individual titles, see N79-32226 through N79-32241.

N79-32226*# Georgia Inst. of Tech., Atlanta. Engineering Experiments Station.
SYSTEMS ENGINEERING OVERVIEW FOR REGENERATIVE LIFE-SUPPORT SYSTEMS APPLICABLE TO SPACE HABITATS c15
Jack Spurlock and Michael Modell (MIT) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 1-11 refs (For primary document see N79-32225 23-12) Avail: NTIS MF A01; SOD HC CSCL 22B

The Life-Support Systems Group of the 1977 NASA Ames Summer Study conducted analyses initially to identify areas where partial or complete closure of the life-support system, for various types of space habitats, should be considered, and to develop a sound methodology for identifying, screening, and evaluating alternative closure schemes. Results of these analyses, including the systems engineering considerations that affect technology-development planning and management for regenerative life-support systems, are discussed. A recommended methodology is also presented as a basis for future technology-development activities in this area. Author

N79-32227*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RESEARCH PLANNING CRITERIA FOR REGENERATIVE LIFE-SUPPORT SYSTEMS APPLICABLE TO SPACE HABITATS c15
Jack Spurlock (Georgia Inst. of Technol.), William Cooper (Michigan State Univ.), Paul Deal, Annitá Harlan (Pima Coll.), Marcus Karel (MIT), Michael Modell (MIT), Paul Moe (Natl. Agr. Res. Center), John Phillips (Arizona Univ.), David Putnam (Umpqua Res. Co.), Philip Quattrone et al *In its* Space Resources and Space Settlements 1979 p 13-30 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22B

The second phase of analyses that were conducted by the Life Support Systems Group of the 1977 NASA Ames Summer Study is described. This phase of analyses included a preliminary review of relevant areas of technology that can contribute to the development of closed life-support systems for space habitats, the identification of research options in these areas of technology, and the development of guidelines for an effective research program. The areas of technology that were studied included: (1) nutrition, diet, and food processing; (2) higher plant agriculture; (3) animal agriculture; (4) waste conversion and resource recovery; and (5) system stability and safety. Results of these analyses, including recommended research options and criteria for establishing research priorities among these many options, are discussed. G.Y.

N79-32228*# General Dynamics Corp., San Diego, Calif.
EFFECT OF ENVIRONMENTAL PARAMETERS ON HABITAT STRUCTURAL WEIGHT AND COST c15
Edward Bock, Fred Lambrou, Jr. (Princeton Univ.), and Michael

Simon (Stanford Univ.) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 33-60 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22B

Space-settlement conceptual designs were previously accomplished using earth-normal physiological conditions. The habitat weight and cost penalties associated with this conservative design approach are quantified. These penalties are identified by comparison of conservative earth-normal designs with habitats designed to less than earth-normal conditions. Physiological research areas are also recommended as a necessary prerequisite to realizing these potential weight and cost savings. Major habitat structural elements, that is, pressure shell and radiation shielding, for populations of 100, 10,000, and 1,000,000, are evaluated for effects of atmospheric pressure, pseudogravity level, radiation shielding thickness, and habitat configuration. G.Y.

N79-32229*# Science Applications, Inc., Pleasanton, Calif.
HABITAT AND LOGISTIC SUPPORT REQUIREMENTS FOR THE INITIATION OF A SPACE MANUFACTURING ENTERPRISE **c15**
J. Peter Vajk, Joseph H. Engel (Illinois Univ.), and John A. Shettler (GM) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 61-83 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22B

A detailed scenario for the initiation of a space manufacturing enterprise using lunar materials to construct solar power satellites (SPS) was developed, with particular attention to habitat design and logistic support requirements. If SPS's can be constructed exclusively from lunar materials, the entire enterprise can be initiated in a 7 year period of launch activity (beginning as early as 1985) using the Space Shuttle and a low-cost, Shuttle-derived heavy lift vehicle. If additional chemical feedstocks must be imported from earth in significant quantities, it may be necessary to bring the next-generation launch vehicle (single-stage-to-orbit) into operation by 1991. The scenario presented features use of the mass-driver reaction engine for orbit-to-orbit transfer of cargos and makes extensive use of the expendable Shuttle external propellant tanks. G.Y.

N79-32230*# Hampshire Coll., Amherst, Mass. Dept. of Physics.
MASS DRIVERS. 1: ELECTRICAL DESIGN **c37**
William Arnold, Stuart Bowen, Kevin Fine (MIT), David Kaplan (Michigan Univ.), Margaret Kolm (Haverford Coll.), Henry Kolm (MIT), Jonathan Newman (Amherst Coll.), Gerard K. ONeill (Princeton Univ.), and William Snow (MIT) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 87-100 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 13I

A mass driver is an electrical device used to accelerate payloads of any material to a high velocity. Small vehicles (called buckets) containing superconducting coils carry the payloads. These buckets are accelerated by pulsed magnetic fields, timed by information on their position, and are guided by induced magnetic fields set up in a surrounding guideway. Upon reaching the correct velocity, the buckets release their payloads, then they are slowed for recirculation to be reused. A rationale is presented that leads to a relatively simple and near-optimum design, as well as basic programs for calculating acceleration. The transverse oscillation frequencies are found to be invariant to guideway transverse dimensions. Author

N79-32231*# Hampshire Coll., Amherst, Mass. Dept. of Physics.
MASS DRIVERS. 2: STRUCTURAL DYNAMICS **c37**
William Arnold, Stuart Bowen, Kevin Fine (MIT), David Kaplan (Michigan Univ.), Margaret Kolm (Haverford Coll.), Henry Kolm (MIT), Jonathan Newman (Amherst Coll.), Gerard K. ONeill (Princeton Univ.), and William Snow (MIT) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 101-118 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 13I

Various structural and dynamical problems related to both small-scale forces between the drive coils and within the bucket structure as well as the overall combined large-scale dynamical interaction of the bucket stream and MDRE (Mass Drive Reaction Engine) structure are examined. The large-scale dynamics appear weakly stable. Finally, MDRE operation in an inverse-square-law gravitational field is discussed and the required curved shape of the guideway is computed. Author

N79-32232*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MASS DRIVERS. 3: ENGINEERING **c37**
William Arnold (Hampshire Coll.), Stuart Bowen, Steve Cohen, Kevin Fine (MIT), David Kaplan (Michigan Univ.), Margaret Kolm (Haverford Coll.), Henry Kolm (MIT), Jonathan Newman (Amherst Coll.), Gerard K. ONeill (Princeton Univ.), and William Snow (MIT) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 119-157 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 13I

The last of a series of three papers by the Mass-Driver Group of the 1977 Ames Summer Study is presented. It develops the engineering principles required to implement the basic mass-driver. Optimum component mass trade-offs are derived from a set of four input parameters, and the program used to design a lunar launcher. The mass optimization procedures is then incorporated into a more comprehensive mission optimization program called OPT-4, which evaluates an optimized mass-driver reaction engine and its performance in a range of specified missions. Finally, this paper discusses, to the extent that time permitted, certain peripheral problems: heating effects in buckets due to magnetic field ripple; an approximate derivation of guide force profiles; the mechanics of inserting and releasing payloads; the reaction mass orbits; and a proposed research and development plan for implementing mass drivers. G.Y.

N79-32233*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Mission Design Section.
ROUND-TRIP MISSIONS TO LOW DELTA-V ASTEROIDS AND IMPLICATIONS FOR MATERIAL RETRIEVAL **c13**
David F. Bender, R. Scott Dunbar (Princeton Univ.), and David J. Ross (Stanford Univ.) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 161-172 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22A

Low-delta-V asteroids are to be found among those which have perihelia near 1 AU. From the 50 known asteroids with perihelia less than 1.5 AU, 10 candidates for asteroid retrieval missions were selected on the basis of low eccentricity and inclination. To estimate the ranges of orbital elements for which capture in earth orbit may be feasible, a survey was made of 180 deg transfer from a set of orbits having elements near those of the earth to the earth. For 2 of the 10 low-delta-V asteroids and for an additional one with elements more earth-like than any yet known, direct ballistic round trips in the 1980's were computed. A stay time of several months at the asteroid was used. The results show that the total delta V, including that for rendezvous with earth upon return, for the known asteroids is above 14 km/sec. But if asteroids are found similar to the strawman considered, the total delta V could be as low as 10 km/sec. Author

N79-32234*# Princeton Univ., N. J. Dept. of Physics.
RETRIEVAL OF ASTEROIDAL MATERIALS **c13**
Brian OLeary, Michael J. Gaffey (Hawaii Univ.), David J. Ross (Stanford Univ.), and Robert Salkeld *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 173-189 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22A

Earlier scenarios for mass-driver retrieval of asteroidal materials were tested and refined after new data were considered on mass-driver performance, favorable delta-V opportunities to earth-approaching asteroids with gravity assists, designs for mining equipment, opportunities for processing volatiles and free metals at the asteroid, mission scenarios, and parametric studies of the most sifnificant variables. It is concluded that the asteroid-retrieval option is competitive with the retrieval of lunar materials for space manufacturing, while a carbonaceous object would provide a distinctive advantage over the earth as a source of consumables and raw materials for biomass in space settlements during the 1990's. Immediate studies on asteroid-retrieval mission opportunities, an increased search and followup program, precursor

missions, trade-offs with the moon and earth as sources of materials, and supporting technology are recommended. Author

N79-32235*# Hawaii Univ., Honolulu. Dept. of Astronomy.
AN ASSESSMENT OF NEAR-EARTH ASTEROID RESOURCES c13
Michael J. Gaffey, Eleanor F. Helin (California Inst. of Technol.), and Brian OLeary (Princeton Univ.) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 191-204 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22A

On the basis of remote-sensing evidence and meteorite studies, a substantial fraction of small asteroids in near-earth space should contain abundant volatile (water, carbon, carbon compounds) and/or free metal (nickel-iron) materials. Although there are only about 40 known earth-approaching asteroids, this number could be increased by at least an order of magnitude in a few years by a dedicated search program with a large telescope (48 in. Schmidt). A discovery rate of 20 objects/yr could be expected from a facility costing about $3 million to establish. Relatively high-resolution, broad-wavelength coverage reflectance spectra could be made for many of these objects with a large telescope and instruments under development. Such spectra are necessary for detailed mineralogic, characterizations of these asteroids. Low-resolution survey survey spectra with similar wavelength coverage (UBVRIJHK filters) would provide useful characterizations of fainter objects. A.R.H.

N79-32236*# Lunar Science Inst., Houston, Tex.
THE INITIAL LUNAR SUPPLY BASE
David Criswell *In* NASA. Ames Res. Center. Space Resources and Space Settlements 1979 p 207-224 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22A

The first lunar supply base should have a mass less than 1000 tons, be deployed by 24 persons in 4 months, and be maintained by 10 persons. Output could be expanded 20 times in 5 years to 600,000 tons/yr by a factor of 10 expansion of the area of the solar array on the lunar surface, using low power soil beneficiation, increasing the fleet of mining vehicles, and illuminating the base continuously at night with lunar orbiting mirrors. The space manufacturing facility (SMF) will supply most of the mass (solar cells and orbiting mirrors) necessary for expansion. Several devices and procedures are suggested for development which could further reduce the total mass necessary to transport to the Moon to establish the initial lunar supply base. Author

N79-32237*# Michigan Univ., Ann Arbor. Dept. of Aeronautical Engineering.
EXTRATERRESTRIAL FIBERGLASS PRODUCTION USING SOLAR ENERGY
Darwin Ho and Leon E. Sobon *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 225-232 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22A

A conceptual design is presented for fiberglass production systems in both lunar and space environments. The raw material, of lunar origin, will be plagioclase concentrate, high silica content slag, and calcium oxide. Glass will be melted by solar energy. The multifurnace in the lunar plant and the spinning cylinder in the space plant are unique design features. Furnace design appears to be the most critical element in optimizing system performance. A conservative estimate of the total power generated by solar concetrators is 1880 kW; the mass of both plants is 120 tons. The systems will reproduce about 90 times their total mass in fiberglass in 1 year. A new design concept would be necessary if glass rods were produced in space. Author

N79-32238*# Ford Aerospace and Communications Corp., Palo Alto, Calif.
LUNAR BUILDING MATERIALS: SOME CONSIDERATIONS ON THE USE OF INORGANIC POLYMERS c27
Stuart M. Lee *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 233-241 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 07D

The use of inorganic polymer systems synthesized from the available lunar chemical elements, viz., silicon, aluminum, and oxygen to make adhesives, binders, and sealants needed in the fabrication of lunar building materials and the assembly of structures is considered. Inorganic polymer systems, their background, status, and shortcomings, and the use of network polymers as a possible approach to synthesis are examined as well as glassy metals for unusual structural strength, and the use of cold-mold materials as well as foam-sintered lunar silicates for lightweight shielding and structural building materials. A.R.H.

N79-32239*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A GEOLOGIC ASSESSMENT OF POTENTIAL LUNAR ORES c91
David S. McKay and Richard J. Williams *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 243-255 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 03B

Although bulk lunar soil is not a suitable feedstock for extracting metals, certain minerals such as anorthite and ilmenite can be separated and concentrated. These minerals can be considered as potential ores of aluminum, silicon, titanium, andiron. A separation and metal extraction plant could also extract large amounts of oxygen and perhaps hydrogen from these minerals. Anorthie containing 19 percent aluminum and 20 percent silicon can be concentrated from some highland soils where it is present in amounts up to 60 percent. Ilmenite containing 32 percent titanium and 37 percent iron can be concentrated from some mare soils where it is present in amounts up to 10 percent. The ideal mining site would be located at the boundary between a high-titanium mare and a high-aluminum highlands. Such area may exist around the rims of some eastern maria, particularly Tranquilitatis. A location on Earth with raw materials as described above would be considered an economically valuable ore deposit if conventional terrestrial resources were not available. A.R.H.

N79-32240*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXTRACTION PROCESSES FOR THE PRODUCTION OF ALUMINUM, TITANIUM, IRON, MAGNESIUM, AND OXYGEN AND NONTERRESTRIAL SOURCES
D. Bhogeswara Rao (Lawrence Berkeley Lab.), U. V. Choudary (Wisconsin Univ., Milwaukee), T. E. Erstfeld (Lunar Science Inst.), R. J. Williams (Wisconsin Univ., Milwaukee), and Y. A. Chang *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 257-274 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22A

The suitability of existing terrestrial extractive metallurgical processes for the production of Al, Ti, Fe, Mg, and O2 from nonterrestrial resources is examined from both thermodynamic andkinetic points of view. Carbochlorination of lunar anorthite concentrate in conjunction with Alcoa electrolysis process for Al; carbochlorination of lunar ilmenite concentrate followed by Ca reduction of TiO2; and subsequent reduction of Fe2O3 by H2 for Ti and Fe, respectively, are suggested. Silicothermic reduction of olivine concentrate was found to be attractive for the extraction of Mg becaue of the technological knowhow of the process. Aluminothermic reduction of olivine is the other possible alternative for the production of magnesium. The large quantities of carbon monoxide generated in the metal extraction processes can be used to recover carbon and oxygen by a combination of the following methods: (1) simple disproportionation of CO,(2) methanation of CO and electrolysis of H2O, and (3) solid-state electrolysis of gas mixtures containing CO, CO2, and H2O. The research needed for the adoption of earth-based extraction processes for lunar and asteroidal minerals is outlined. Author

N79-32241*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MINING AND BENEFICIATION OF LUNAR ORES c91
Theodore E. Bunch, Richard J. Williams (NASA. Johnson Space Center), David S. McKay (NASA. Johnson Space Center), and David Giles (Rio Amex Corp.) *In its* Space Resources and Space Settlements 1979 p 275-288 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 03B

The beneficiation of lunar plagioclase and ilmenite ores to feedstock grade permits a rapid growth of the space manufacturing economy by maximizing the production rate of metals and oxygen. A beneficiation scheme based on electrostatic and magnetic separation is preferred over conventional schemes, but such a scheme cannot be completely modeled because beneficiation processes are empirical and because some properties of lunar minerals have not been measured. To meet anticipated shipping and processing needs, the peak lunar mining rate will exceed 1000 tons/hr by the fifth year of operation. Such capabilities will be best obtained by automated mining vehicles and conveyor systems rather than trucks. It may be possible to extract about 40 kg of volatiles (60 percent H2O) by thermally processing the less than 20 micron ilmenite concentrate extracted from 130 tons of ilmenite ore. A thermodynamic analysis of an extraction process is presented. Author

N79-32242# European Space Agency, Paris (France).
EUROPEAN SPACE ACTIVITIES
R. D. Andresen, F. Beeckmans, A. C. Durney, B. Feuerbacher, K. Knott, F. Macchetto, A. Peacock, M. Penston, R. Reinhard, K. P. Wenzel et al May 1979 280 p refs Presented at 22d COSPAR Plenary Meeting, Bangalore, India, Jun. 1979
(SP-1014) Avail: NTIS HC A13/MF A01

The report includes a description of the performances of satellites in orbit or which have been in orbit, such as HEOS-2, TD-1, ESRO-4, COS-B, Geos-1, ISEE, IVE, and Geos-2 projects under development, such as the first Spacelab mission, Exosat, the international solar polar mission, ESA participation in the NASA Space Telescope program, the liquid helium cryostat, and the Fire wheel are also presented. Projects under study are summarized. Author (ESA)

N79-32243# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Forschungsbereich Nachrichtentechnik und Erkundung.
CONTRIBUTIONS TO THE 'DATA SYSTEMS ENGINEERING IN SPACE TRAVEL' SYMPOSIUM
8 Nov. 1978 156 p refs In GERMAN; ENGLISH summary Presented at Symp. Sys. Eng. in Space Travel, Oberpfaffenhofen, West Ger., 18 Jan. 1978 Report will also be announced as translation (ESA-TT-587)
(DLR-Mitt-78-02) Avail: NTIS HC A08/MF A01; DFVLR, Cologne DM 53,50

The subjects treated are the use of a process control computer as a component of complex systems, data handling for medical experiments in the space laboratory preprogram ASSESS 2, and computer assisted data acquisition for space flight are among the topics covered. A system for the interactive processing of picture data obtained from geostationary weather satellites is described. The application of computer controlled manipulations to underwater technology, the need for operational data handling in accurate satellite tracking, onboard autonomy in satellite control, and coupling of IBM and Siemens systems on a BJE basis as implemented in the regional computer center for the universities of Mannhein and Heidelberg are included. The use of the OMS - MVS operational system in technical scientific fields, software and PROINF applications with EBOSIPES, and process control for RIT 10 lifetime tests is discussed. Author (ESA)

N79-32244# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Raumfahrt.
ARIANE PASSENGER EXPERIMENT (APEX): PLANNING STUDY Final Report
Hennig V. Bassewitz, Helmut Bassner, Klaus Bohnhoff, Klaus Fetzer, Herbert Imbiel, Hans Kellermeier, Gunther Kleinlein, and Wolfgang Kleinau Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1977 323 p In GERMAN; ENGLISH summary
(Contracts BMFT-WRT-1075; DFVLR-BPT-01-YA-016)
(BMFT-FB-W-77-24) Avail: NTIS HC A14/MF A01; ZLDI, Munich DM 67,60

The ARIANE development flight L04, scheduled for Dec. 1980, offers the possibility of flying a passenger test satellite at low cost. Such a passenger would allow for testing and flight-qualification of satellite application components newly developed and ground tested or currently under development. This mission goal, its feasibility, and the costs necessary to its achievement were studied. Three passenger satellite alternatives, all based on the same satellite platform bus, were compared. These are: (1) a double-U structure (INTELSAT 5) equipped with a unified propulsion system plus an ion drive for attitude corrections, an ultralight panel solar generator, and two KfK offset antennas with 2 m diameter apertures; (2) a modular structure equipped with a unified propulsion system plus a hyrazine rocket, and the same solar power unit and antenna array as the first as well as additional ESA experiments; and (3) a double-U structure (INTELSAT 5) equipped with a central engine plus a liquid propellant stabilizing system, a modified solar power unit, a French-German jointly developed antenna array, and spin stabilized transfer with an active nutation damper. No final passenger satellite configuration has as yet been chosen. Author (ESA)

N79-32245# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
REQUIREMENTS ANALYSIS AND FEASIBILITY STUDY FOR THE SPACELAB USER PROGRAM: SUPERSENSITIVE OPTICAL ACCELEROMETER Final Report
Walter Knabe, Fromund Hock, Hansjoerg Klotz, Tuncer Miski, Wol-Rainer Ilenburg, Dieter Langbein, and Friedrich-Wilhelm Meyer Bonn Bundesmin. fuer Forsch. u. Technol. Aug. 1978 268 p refs In GERMAN; ENGLISH summary
(Contracts BMFT-WRT-1076; DFVLR-BPT-01-QV-316)
(BMFT-FB-W-78-18) Avail: NTIS HC A12/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 56,10

Proceeding from a comparative appraisal of the accelerometers used in aeronautics and astronautics, the spectrum of applications of, as well as the need for, a supersensitive acceleration sensor was determined in regard to the planned or already inititated space activities of the Federal Republic of Germany. Keyed specifically to the needs of the Spacelab utilization program, an optical acceleration sensor for weak acceleration fields ($< 1/1000$ g) was conceptually developed and formulated. Also, its feasibility was demonstrated regarding its role as an autonomous measuring instrument for residual accelerations and as a sensor component in a control loop for compensating existing perturbative accelerations (drag-free system). A preliminary instrument design of an autonomous accelerometer for use in the Spacelab module is presented and its construction is described. Author (ESA)

N79-32246# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
STUDY ON EXPENDITURE OPTIMIZATION FOR SATELLITE AND SPACELAB EXPERIMENTS Final Report
Hartmut Siemann and Hans Wagner Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 61 p In GERMAN; ENGLISH summary
(Contracts BMFT-WRT-1077; DFVLR-BPT-01-OO-187)
(BMFT-FB-W-78-34) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 12,60

A system of objectives was elaborated in order to derive recommendations for expenditure optimization for satellite and Spacelab experiments. It is recommended to apply in both cases a two-model philosophy where the flight unit is equipped with integrated circuits qualified according to Mil-Std.- 833, Method 5004, Class B. As for product assurance the optimum is a program requiring approximately 8% of the total program costs. Author (ESA)

N79-32247# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
MAGNETOSPHERE SOUNDING ROCKET PROGRAM. A SUBSTORM PHENOMENA PAYLOAD. REPORT ON SYSTEM DESIGN, INTEGRATION, TESTING, AND FLIGHT Final Report
Hans-Heinrich Pechstein, Walter Schnattinger, Eberhardt Waffenschmidt, Walter Schrieder, Fritz Gampe, and Juergen Lang Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 170 p refs In GERMAN; ENGLISH summary
(Contracts BMFT-WRK-0274; DFVLR-BPT-01-OM-036)
(BMFT-FB-W-78-35) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 34,45

As part of the rocket sounding campaign conducted in

Andenes, Norway, from September 1977 to January 1978, four identical payloads for the investigation of the magnetosphere response to magnetic substorms were developed, built, and qualified. The experiment package was designed for use in a Skylark 12 nose cone. All four units were successfully flown during substorm events. Details on the development, manufacturing, testing, and launch preparation of these payloads are given. The post flight reports filed on the performances of the experiments and the rockets are also included. Author (ESA)

N79-32248# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
PROPOSAL FOR AN INTERPLANETARY MISSION TO SOUND THE OUTER REGIONS OF THE SOLAR CORONA
H. Porsche, H. Volland (Bonn Univ.), M. K. Bird (Bonn Univ.), and P. Edenhofer (Ruhr Univ.) 1978 18 p refs
Avail: NTIS HC A02/MF A01

A mission is proposed to continuously investigate the medium and outer regions of the corona by coronal sounding. The main task would be the sounding of the sun corona by a spacecraft orbiting the sun such that it is standing continously near superior conjunction. The orbit period is then exactly one year. A small inclination of the orbit combined with a small eccentricity causes the spacecraft to virtually encircle the solar disk in a small offset distance as seen from the earth. The minimum payload for the mission is described, including uplink and downlink operation at S and X band frequencies, range rate Doppler measurements, electron content, and Faraday rotation. An additional sun backside payload and on interplanetary payload is also suggested. Author (ESA)

N79-32249# Oesterreichische Akademie der Wissenschaften, Vienna.
SPACE ACTIVITY IN AUSTRIA, 1978/79
Ferdinand Steinhauser Apr. 1978 27 p refs Presented at 22d COSPAR Plenary Meeting and Assoc. Activities, Bangalore, India, 29 May-9 Jun. 1979
Avail: NTIS HC A03/MF A01

The activities of the Austrian Solar and Space Agency (ASSA) along with those of its associated institutions are reported. The participation of ASSA in the ESA SPACELAB program is discussed in detail. Individual synopses of the space research activities of each of the ASSA associate institutions include descriptions of rocket sounding programs, studies of solar activity effects, a synoptic approach to meteorology, a geochemical study of primitive samples from the earth and moon, and a discussion of spectroscopic observations of stellar phenomena. Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N79-32233*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Mission Design Section.
ROUND-TRIP MISSIONS TO LOW DELTA-V ASTEROIDS AND IMPLICATIONS FOR MATERIAL RETRIEVAL
David F. Bender, R. Scott Dunbar (Princeton Univ.), and David J. Ross (Stanford Univ.) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 161-172 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22A

N79-32234*# Princeton Univ., N. J. Dept. of Physics.
RETRIEVAL OF ASTEROIDAL MATERIALS
Brian OLeary, Michael J. Gaffey (Hawaii Univ.), David J. Ross (Stanford Univ.), and Robert Salkeld *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 173-189 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22A

N79-32235*# Hawaii Univ., Honolulu. Dept. of Astronomy.
AN ASSESSMENT OF NEAR-EARTH ASTEROID RESOURCES
Michael J. Gaffey, Eleanor F. Helin (California Inst. of Technol.), and Brian OLeary (Princeton Univ.) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 191-204 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22A

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N79-32250# Martin Marietta Aerospace, Orlando, Fla.
AERODYNAMIC STABILITY TECHNOLOGY FOR MANEUVERABLE MISSILES. VOLUME 1: CONFIGURATION AERODYNAMIC CHARACTERISTICS Final Report, Feb. 1975 - Dec. 1976
Gennaro F. Aiello and Michael C. Bateman Wright-Patterson AFB, Ohio AFFDL Mar. 1979 391 p refs
(Contract F33615-75-C-3052; AF Proj. 8219)
(AD-A070250; OR-14027-Vol-1; AFFDL-TR-76-55-Vol-1) Avail: NTIS HC A17/MF A01 CSCL 20/4

This study developed empirical methods to predict aerodynamic characteristics of body-tail, body-wing-tail and body-strake-tail missile configurations. Methods cover the Mach number range from 0.6 to 3.0. Methods cover the individual body and tail characteristics at angles of attack from 0 to 180 degrees. For winged bodies the methods encompass angles of attack up to about 30 degrees. All mutual interference effects are accounted for, allowing accurate prediction of force and moment coefficients. GRA

N79-32251# Administrative Sciences Corp., Alexandria, Va.
NAVY AIR-LAUNCHED MISSILE OPERATING AND SUPPORT COST ESTIMATING MODEL
Paul T. Heilig Apr. 1979 196 p refs
(Contract N00014-77-C-0180)
(AD-A069527; ASC-R-118) Avail: NTIS HC A09/MF A01 CSCL 16/4

The Cost Analysis Improvement Group (CAIG), which is responsible for policy and guidance for cost analysis in the Department of Defense, issued a memorandum which contained an operating and support cost element structure (CES) for tactical air-launched missiles, to be used in all Defense System Acquisition Review Council reviews and other missile cost analyses. Accordingly, the Resource Analysis Group (Op-96D), which is responsible for independent cost analysis within the Navy, tasked Administrative Sciences Corporation to undertake a study. The CES which was developed contains sixteen cost elements which define and encompass the same activities described in the CAIG memorandum. Each cost element is discussed in detail in the body of this report. All pertinent data which was collected during the study is included, as well as examples of Navy documents which can be used for cost estimating in the future. Each source is identified by a point of contact and a DOD telephone number. All explanatory variables which were employed in the study, whether used in a cost-estimating relationship or not, are also included. GRA

N79-32252# Compagnia Nazionale Aerospaziale S.p.A., Rome (Italy).

SIRIO 2: SATELLITE FOR EUROPEAN SPACE AGENCY. EXECUTIVE SUMMARY
May 1979 28 p
Avail: NTIS HC A03/MF A01

The European Space Agency project SIRIO 2 is reported. The design of the satellite is described, and similarities with the SIRIO 1 satellite, which is on geosynchronous station are noted. The meteorological data distribution mission of the satellite is discussed, and how this mission complements the METEOSAT program is shown. A laser clock synchronization experiment, also to be flown on the SIRIO 2 spacecraft, is presented. Finally, the ground segment of the SIRIO 2 program is discussed.
Author (ESA)

N79-32253# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).
AERONOMY SOUNDING ROCKET PROGRAM. RESULTS OF THE GUARD RING PROBE EXPERIMENT FLOWN ON THE PAYLOAD B1 OF THE NATIONAL AERONOMY WINTER ANOMALY AND TRACE CONSTITUENTS PROGRAM AT EL ARENOSILLO, SPAIN, BETWEEN DECEMBER 1975 AND JANUARY 1976 Final Report
Hans-Ulrich Widdel Bonn Bundesmin. fuer Forsch. u. Technol. Nov. 1978 35 p refs In GERMAN; ENGLISH summary
(Contracts BMFT-WRK-0274; DFVLR-BPT-01-D1-173)
(BMFT-FB-W-78-26) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 7.15

The guard ring probe experiment which was flown during the aeronomy program 15 times is briefly described and the results obtained are given. The fairly high frequency of launches made it possible to follow in quite some detail the development of so-called waves of winter anomalously high absorption. It was found the development of such a winter anomaly wave was preceded by a change in the numeric density of negative ions below 60 km. This change cannot be observed by ground-based absorption measurements using short wave radio waves. The observation can be interpreted as the result of a depletion of the water content of the mesosphere which also comprises lower heights. A possibility for an experimental verification of this interpretation is suggested. Author (ESA)

N79-32254# National Aerospace Lab., Amsterdam (Netherlands). Div. of Spaceflight Technology.
MILITARY SATELLITE COMMUNICATIONS, HISTORY AND STATUS AS OF 1974
J. P. B. Vreeburg Apr. 1979 72 p refs Sponsored by Directorate of Material Air, RNLAF
(NRL-TR-74173-U) Avail: NTIS HC A04/MF A01

After a short introduction to various types of links and network organizations, the experimental phase in military satellite communications systems is described in a chronological discussion of early communications satellites. This experimental phase is considered to have ended with the TASCAT and IDCSP satellites. Present systems and systems of the near future are covered in subsequent sections. Technological and operational state of the art is highlighted in connection with orbits, launchers, satellite and earth terminal systems, and multiple access techniques. A special section is devoted to features concerning the vulnerability of satcom systems and intends to show that one may well expect such vulnerability to be less than for traditional systems. Extensive references to detailed discussions of various problems connected with military satcom are provided from a list of easily accessible literature. Author (ESA)

N79-32255# National Aerospace Lab., Amsterdam (Netherlands). Div. of Spaceflight Technology.
SOME INVESTIGATIONS ON THE NOTCHING PROCEDURE USED IN SHAKER TESTS ON SATELLITES
H. H. Ottens Apr. 1979 21 p refs
(Contract NIVR-1778)
(NLR-TR-76134-U) Avail: NTIS HC A02/MF A01

The notching procedure as used in the shaker test on a satellite is critically examined. Instead of the notching procedure, an alternative test set-up in which the dynamic interaction between launcher and spacecraft is taken into account, was proposed and investigated for a simple model of launcher and satellite. Using this test set-up the response levels near the resonance frequency of the satellite is found to be too high as compared with the allowable notch level. This difference is mainly caused by the fact that simulating sinusoidal shaped transients by a sine sweep test is conservative. Author (ESA)

N79-32226*# Georgia Inst. of Tech., Atlanta. Engineering Experiments Station.
SYSTEMS ENGINEERING OVERVIEW FOR REGENERATIVE LIFE-SUPPORT SYSTEMS APPLICABLE TO SPACE HABITATS
Jack Spurlock and Michael Modell (MIT) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 1-11 refs (For primary document see N79-32225 23-12) Avail: NTIS MF A01; SOD HC CSCL 22B

N79-32227*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RESEARCH PLANNING CRITERIA FOR REGENERATIVE LIFE-SUPPORT SYSTEMS APPLICABLE TO SPACE HABITATS
Jack Spurlock (Georgia Inst. of Technol.), William Cooper (Michigan State Univ.), Paul Deal, Annita Harlan (Pima Coll.), Marcus Karel (MIT), Michael Modell (MIT), Paul Moe (Natl. Agr. Res. Center), John Phillips (Arizona Univ.), David Putnam (Umpqua Res. Co.), Philip Quattrone et al *In its* Space Resources and Space Settlements 1979 p 13-30 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22B

N79-32228*# General Dynamics Corp., San Diego, Calif.
EFFECT OF ENVIRONMENTAL PARAMETERS ON HABITAT STRUCTURAL WEIGHT AND COST
Edward Bock, Fred Lambrou, Jr. (Princeton Univ.), and Michael Simon (Stanford Univ.) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 33-60 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22B

N79-32229*# Science Applications, Inc., Pleasanton, Calif.
HABITAT AND LOGISTIC SUPPORT REQUIREMENTS FOR THE INITIATION OF A SPACE MANUFACTURING ENTERPRISE
J. Peter Vajk, Joseph H. Engel (Illinois Univ.), and John A. Shettler (GM) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 61-83 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 22B

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N79-32256# ARO, Inc., Arnold Air Force Station, Tenn.
DATA VERIFICATION TESTS OF A 0.03-SCALE NASA SPACE SHUTTLE LAUNCH VEHICLE AT MACH NUMBERS FROM 0.60 TO 1.55 Final Report
J. A. Black and R. E. Graham AEDC Nov. 1978 51 p refs Sponsored by the Air Force
(AD-A070442; AEDC-TSR-78-P54) Avail: NTIS HC A04/MF A01 CSCL 22/2

A 0.03-scale model of the NASA Space Shuttle Launch Vehicle was tested September 19-20 and September 29-30, 1978, in the Propulsion Wind Tunnel (16T) at free-stream Mach numbers from 0.60 to 1.55, free-stream dynamic pressures from 387 to 658 psf, angles of attack from -8 to 8 deg, angles of sideslip from -6 to 6 deg, and roll angles of 0, 180, 90, and -90 deg with nominal inboard elevon deflections of 10 deg and outboard elevon deflections of 5 deg. The objectives of the test were to determine flow angularity on the standard sting support system (first entry) and high-pitch support system second entry), and to provide data throughout an alpha/beta matrix to establish a data base for the determination of angular corrections to be

applied to previously obtained data if such corrections are necessary. Author (GRA)

N79-32257# ARO, Inc., Arnold Air Force Station, Tenn.
SPACE SHUTTLE EXTERNAL TANK INSTRUMENTATION EVALUATION Final Report
D. W. Stallings AEDC Feb. 1979 33 p refs
(AD-A070443; AEDC-TSR-79-V11) Avail: NTIS HC A03/MF A01 CSCL 22/2

Data were obtained on the performance of space shuttle flight instrumentation under simulated flight conditions. These conditions included ablating insulation material. The tests were conducted at a free-stream Mach number of 10 and tunnel stilling chamber conditions of 1800 psia and 1900 R. GRA

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N79-32258# Utah State Univ., Logan. Space Science Lab.
DESIGN AND DEVELOPMENT OF A TELEMETRY LOGGING SYSTEM Scientific Report, Jun. 1977 - Jun. 1978
Michael A. Smith Jun. 1978 111 p refs
(Contract F19628-76-C-0261)
(AD-A070310; AFGL-TR-78-0180) Avail: NTIS HC A06/MF A01 CSCL 09/6

This report documents the design and development of a telemetry logging system that formats and records analog and digital data from rocketborne instruments. The main objective in the development of this system was to improve data acquisition capability so on-the-spot data plots of the instrument measurements would be available for quick-look analyses. The system design includes an explanation of the controller-subcontroller design concept with schematic illustrations and processed data samples. Author (GRA)

N79-32259# Technology Service Corp., Santa Monica, Calif.
DESIGN OF AN IMPROVED AIR QUALITY TELEMETRY SYSTEM Final Report
John A. Eldon, Michael D. Teener, and John D. Gins Mar. 1979 101 p refs Sponsored by California State Air Resources Board
(PB-296076/3; TSC-PD-B571-4; ARB-R-A6-207-30-78-96) Avail: NTIS HC A06/MF A01 CSCL 09F

An engineering study of the feasibility of improving the air quality telemetry system is presented. The existing system is described along with some improvement ideas. Four alternative systems incorporating the improvements are described. The four designs were then analyzed to identify their relative advantages and drawbacks. GRA

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N79-32260# National Aerospace Lab., Amsterdam (Netherlands). Div. of Spaceflight Technology.
MULTIPLE ATTITUDE MANEUVERS FOR A SPINNING SPACECRAFT DISTURBED BY SOLAR RADIATION
P. T. L. M. vanWoerkom 5 Feb. 1978 46 p refs
(NLR-TR-78078-U) Avail: NTIS HC A03/MF A01

The attitude motion of interplanetary, spinning spacecraft under the influence of solar radiation and optimal thrusting was investigated. A general model was formulated to describe the forces and torques exerted on the spacecraft due to solar radiation. The model was compared with models available in the large body of literature on the subject. It is found to be mathematically equivalent to a generalized model developed previously for the description of interaction between spacecraft and atmosphere. A geometrical description of the uncontrolled attitude motion is presented. The relevant attitude parameters can be estimated using a simple solar sensor. Assuming pulsed jet microthrusting, both single attitude maneuvers and multiple attitude maneuvers are optimized; the former with respect to fuel mass consumed in a single maneuver, the latter with respect to time elapsed between consecutive single maneuvers. The maneuver sequence is described geometrically. Author (ESA)

N79-32261# National Aerospace Lab., Amsterdam (Netherlands). Div. of Spaceflight Technology.
SURVEY OF MODERN CONTROL AND OBSERVATION THEORY FOR DISTURBED, TARGET FOLLOWING AEROSPACE SYSTEMS. PART 2: STOCHASTIC PERFORMANCE AND SPACECRAFT APPLICATION
P. T. L. M. vanWoerkom 6 Apr. 1978 111 p refs
(Contracts NIVR-1780; NIVR-1858)
(NLR-TR-78082-U-Pt-2) Avail: NTIS HC A06/MF A01

The high accuracy attitude control of a one-dimensionally rotating spacecraft, equipped with a noisy attitude sensor and a noisy reaction wheel for attitude control, acted upon by a noisy external disturbing torque, and required to execute a desired or target attitude motion is discussed. Stochastic stability properties of the closed loop system are investigated, both analytically and geometrically. The results obtained are compared with those of other modern attitude control designs as well as with those of classical attitude control designs. Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N79-32262# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
RESEARCH ON UNSTEADY COMBUSTION PROCESSES Annual Report, 1 Oct. 1977 - 30 Sep. 1978
Leonard H. Caveny, Alon Gany, and Michael M. Micci Nov. 1978 52 p refs
(Grant AF-AFOSR-3104-76)
(AD-A069545; AFOSR-79-0548TR) Avail: NTIS HC A04/MF A01 CSCL 21/8

Nonsteady propellant combustion and chamber flow behavior, particularly as they relate to combustion stability and aluminized propellant combustion are being studied. The first part of the study is centered around the modulated throat rocket motor which is being developed to investigate the dynamic responses of high performance rocket motors in which externally excited longitudinal pressure and velocity waves produce coupling with

propellant combustion processes. Transfer functions between the measured head-end and nozzle-end pressures produce gain and phase information in the vicinity of the first 3 harmonics. GRA

N79-32263# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
ASPECTS OF THE PERFORMANCE OF CHEMICAL ROCKET THRUST SYSTEMS [ASPEKTE ZUR LEISTUNGSVORHERSAGE VON CHEMISCHEN RAKETENTRIEBWERKEN]
M. Braitinger, H. O. Ruppe, and R. H. Schmucker (Bayern Chemie) Sep. 1978 48 p refs In GERMAN
(TUM-LRT-RT-TB-78/3) Avail: NTIS HC A03/MF A01

An attempt is made to present an overall picture of current and future liquid fuel propellant rocket systems. Criteria concerning relative masses for thrust units, fuel and useful loads are examined. A schema is presented showing the various stages (injector, subsonic, transition, and supersonic regions) of the devices studied. The different losses affecting specific impulse, efficiency, and performance, such as kinetic energy, divergence, and boundary effects, are studied. Various calculation procedures (vigorous, simplified, and approximate) are proposed. It is concluded that some improvement in performance is probably feasible with current systems, but that work remains to be done on more advanced futuristic transport concepts. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N79-32264 Massachusetts Univ., Amherst.
APPLICATIONS OF CHEMICAL REACTIONS TO THE DETERMINATION OF TRACE QUANTITIES OF ORGANIC FUNCTIONAL GROUPS Ph.D. Thesis
Satish Mohanlal Mehta 1979 119 p
Avail: Univ. Microfilms Order No. 7920870

New methods were developed for analyzing aliphatic aldehydes, aromatic aldehydes, olefins, and terminal alkynes. The methods are based on selective chemical reactions in which an organic functional group A reacts with an inorganic reagent B, resulting in the isolation of an inorganic species D and an organic species C. The novelty of these methods lies in the utilization of these reactions for analytical purposes for micromolar and submicromolar amounts of functional groups. The final measurement step involves quantitation of inorganic D by means of an atomic absorption spectrophotometer. The methods developed are applicable for the analyses of total functional group content in a given sample. The methods are also viable for routine analyses of organic functional groups in a variety of mixtures because simplicity, selectivity, greater sensitivity, and shorter analysis times are key features. Dissert. Abstr.

N79-32265*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RELEASE-RATE CALORIMETRY OF MULTILAYERED MATERIALS FOR AIRCRAFT SEATS
L. L. Fewell, Fred Duskin (McDonnell Douglas Aircraft Co., Long Beach, Calif.), Howard Spieth (McDonnell Douglas Aircraft Co., Long Beach, Calif.), Ed Trabold (McDonnell Douglas Aircraft Co., Long Beach, Calif.), and J. A. Parker Aug. 1979 26 p refs (NASA-TM-78594; A-7856) Avail: NTIS HC A03/MF A01 CSCL 11G

Multilayered samples of contemporary and improved fire resistant aircraft seat materials (foam cushion, decorative fabric, slip sheet, fire blocking layer, and cushion reinforcement layer) were evaluated for their rates of heat release and smoke generation. Top layers (decorative fabric, slip sheet, fire blocking, and cushion reinforcement) with glass fiber block cushion were evaluated to determine which materials based on their minimum contributions to the total heat release of the multilayered assembly may be added or deleted. Top layers exhibiting desirable burning profiles were combined with foam cushion materials. The smoke and heat release rates of multilayered seat materials were then measured at heat fluxes of 1.5 and 3.5 W/sq cm. Choices of contact and silicone adhesives for bonding multilayered assemblies were based on flammability, burn and smoke generation, animal toxicity tests, and thermal gravimetric analysis. Abrasion tests were conducted on the decorative fabric covering and slip sheet to ascertain service life and compatibility of layers. Author

24 COMPOSITE MATERIALS

Includes laminates.

N79-32266*# Hughes Aircraft Co., Culver City, Calif. Advanced Technology Lab.
FEASIBILITY STUDY OF SILICON NITRIDE PROTECTION OF PLASTIC ENCAPSULATED SEMICONDUCTORS Final Report, 15 Jul. 1978 - 30 Jun. 1979
J. W. Peters, T. C. Hall, J. J. Erickson, and F. L. Gebhart 30 Jun. 1979 58 p
(Contract NAS8-33075)
(NASA-CR-161302; HAC-Ref-1954; FR79-76-943R) Avail: NTIS HC A04/MF A01 CSCL 11C

The application of low temperature silicon nitride protective layers on wire bonded integrated circuits mounted on lead frame assemblies is reported. An evaluation of the mechanical and electrical compatibility of both plasma nitride and photochemical silicon nitride (photonitride) passivations (parallel evaluations) of integrated circuits which were then encapsulated in plastic is described. Photonitride passivation is compatible with all wire bonded lead frame assemblies, with or without initial chip passivation. Plasma nitride passivation of lead frame assemblies is possible only if the chip is passivated before lead frame assembly. The survival rate after the environmental test sequence of devices with a coating of plasma nitride on the chip and a coating of either plasma nitride or photonitride over the assembled device is significantly greater than that of devices assembled with no nitride protective coating over either chip or lead frame. A.W.H.

N79-32267# Duke Univ., Durham, N. C.
RESEARCH WORKSHOP ON MECHANICS OF COMPOSITE MATERIALS
1978 220 p refs Workshop held at Durham, N. C., 17-18 Oct. 1978 Sponsored by ARO and NSF
Avail: NTIS HC A10/MF A01

Researchers were given the opportunity to meet and discuss ideas, techniques, and methodologies used in solving problems in mechanics of composite materials. The researcher's specialties included: (1) development of constitutive models and associated solution techniques; (2) theoretical and experimental studies of fracture and fatigue behavior; and (3) structural applications of composite materials. Lectures and papers are given reflecting these specialties in composite materials. For individual titles, see N79-32268 through N79-32276.

N79-32268# Cranfield Inst. of Tech., Bedfordshire (England).
THE VISCOELASTIC RESPONSE OF COMPOSITE MATERIALS
N. Laws *In* Duke Univ. Res. Workshop on Mech. of Composite Mater. 1978 p 9-31 refs (For primary document see N79-32267 23-24)
Avail: NTIS HC A10/MF A01

The viscoelastic creep compliances of fibrous composites by the self-consistent method are estimated. In order to achieve this, it is shown how to solve various versions of the viscoelastic inclusion problem. The general problem is solved with the help of Stieltjes convolutions. Numerical results for representative problems are given. Some detailed numerical results are given for a unidirectional long-fiber reinforced resin. The effect of fiber length on the overall moduli is discussed. An attempt is made to compare some theoretical predictions with experimental results. G.Y.

N79-32269# Duke Univ., Durham, N. C. School of Engineering.
PLASTICITY OF COMPOSITE LAMINATES
George J. Dvorak and Yehia A. Bahei-El-Din *In its* Res. Workshop on Mech. of Composite Mater. 1978 p 32-54 refs (For

primary document see N79-32267 23-24)
Avail: NTIS HC A10/MF A01

A simple material model is used to derive yield surfaces, hardening, and flow rules for elastic-plastic deformation of a unidirectional metal matrix composite lamina. The constitutive equations are used to solve simple plastic loading problems in laminated plates. A comparison of the calculated results is made with available experiments. Author

N79-32270# Utah Univ., Salt Lake City. Dept. of Mechanical and Industrial Engineering.
CONTINUUM MODELING OF DAMAGE ACCUMULATION AND ULTIMATE FAILURE IN FIBER REINFORCED LAMINATED COMPOSITE MATERIALS
R. J. Nuismer *In* Duke Univ. Res. Workshop on Mech. of Composite Mater. 1978 p 55-77 refs Sponsored in part by AFOSR and AFFDL (For primary document see N79-32267 23-24)
Avail: NTIS HC A10/MF A01

A continuum model of microdamage growth and accumulation and its effect on laminate performance and failure is presented. Only the simplest case of statically applied loads is considered. No attempt is made to model damage growth due to dynamic, fatigue or environmental loadings. It is noted, however, that the static loading case is of considerable interest in its own right due to the relative brittleness of composite laminates and their resulting susceptability to failure from stress concentrations. G.Y.

N79-32271# Delaware Univ., Newark. Center for Composite Materials.
BOUNDARY LAYER EFFECTS IN COMPOSITE LAMINATES
R. Byron Pipes *In* Duke Univ. Res. Workshop on Mech. of Composite Mater. 1978 p 78-126 refs (For primary document see N79-32267 23-24)
(Contract F33615-71-C-1244)
Avail: NTIS HC A10/MF A01

The mechanism of interlaminar load transfer for the fiber-reinforced laminate of finite-width is investigated. Two modes of interlaminar transfer are identified. The first mode characterized by the behavior of the angle-ply laminate is shown to be dominated by the action of the interlaminar shear stress, while the second mode reflects the action of the interlaminar normal stress and is associated with the bidirectional laminate. The behavior of a general laminate configuration is examined. Finally, the influence of interlaminar stresses upon laminate strength is examined. Author

N79-32272*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
THERMORHEOLOGICAL EFFECTS ON FATIGUE LIFE OF FIBER COMPOSITES
C. T. Sun and E. S. Chim *In* Duke Univ. Res. Workshop on Mech. of Composite Mater. 1978 p 129-146 refs (For primary document see N79-32267 23-24)
(Grant NsG-1278)
Avail: NTIS HC A10/MF A01 CSCL 11D

A series of experiments were performed to study the effect of creep strain and temperature on the fatigue life of the graphite epoxy laminate composite. It was concluded that sustained periods of static loading have significant retardation effects on the fatigue life of the laminated composite and that a cyclic loading with a higher frequency preceeding the one with a lower frequency also prolongs the fatigue life. A creep crack model was proposed which can provide interpretations for the experimental results. M.M.M.

N79-32273# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
CHARACTERISTIC DAMAGE STATES IN COMPOSITE LAMINATES
Kenneth L. Reifsnider and Ahmet Talug *In* Duke Univ. Res. Workshop on Mech. of Composite Mater. 1978 p 147-178 refs (For primary document see N79-32267 23-24)
Avail: NTIS HC A10/MF A01

The nature of the characteristic damage state of laminate composites was determined by the laminate properties, their orientations, and their stacking sequence. The detailed nature of this characteristic damage state, the nature of its formation, and its influence on strength, life and stiffness was discussed. M.M.M.

N79-32274# California Univ., Livermore. Lawrence Livermore Lab.
A HIGH-ORDER THEORY OF LAMINATED PLATE DEFORMATION
R. M. Christensen *In* Duke Univ. Res. Workshop on Mech. of Composite Mater. 1978 p 185-194 refs (For primary document see N79-32267 23-24)
Avail: NTIS HC A10/MF A01

A brief review is given of the high-order plate theory derived by Lo, Christensen, and Wu. The theory accounts for the effects of transverse shear deformation, transverse normal strain, and a nonlinear distribution of the in-plane displacements with respect to the thickness coordinate. The theory is compared with lower-order plate theories through application to a particular problem involving a plate acted upon by a sinusoidal surface pressure. Comparison is also made with the exact elasticity solution of this problem. When the ratio of the characteristic length of the load pattern to the plate thickness is of the order of unity, lower-order theories are inadequate and the present high-order theory is required to give meaningful results. Although the results are of significance for both homogeneous and laminated plates, they are shown to be particularly important in the laminated plate case. Author

N79-32275# California Univ., Livermore. Lawrence Livermore Lab.
THREE-DIMENSIONAL STRENGTH CHARACTERIZATION OF THICK COMPOSITE LAMINATES
Edward M. Wu *In* Duke Univ. Res. Workshop on Mech. of Composite Mater. 1978 p 195-200 refs (For primary document see N79-32267 23-24)
(Contract DAA46-75-C-0096)
Avail: NTIS HC A10/MF A01

The combined effects of three-dimensional state of stress on the strength of thick laminates are evaluated by a three-dimensional failure criterion. The tensor polynomial method has been extended with full account given to three-dimensional stress state effects. Materials symmetry conditions are used to reduce the number of independent strength constants. As a consequence, only two additional measurements are required (as compared to the two-dimensional failure characterization). Experimental evaluation of the coefficients has been carried out for a high modulus graphite-epoxy. The combined theoretical development of thick plate analysis and three-dimensional failure criterion should provide more adequate design of thick laminates. M.M.M.

N79-32276# Lehigh Univ., Bethlehem, Pa.
THREE-DIMENSIONAL LAMINATE PLATES WITH THROUGH AND PART-THROUGH CRACKS
G. C. Sih *In* Duke Univ. Res. Workshop on Mech. of Composite Mater. 1978 p 201-208 refs (For primary document see N79-32267 23-24)
Avail: NTIS HC A10/MF A01

The stress intensity factors for three dimensional composites are determined for a variety of material and geometrical parameters such as the stiffness ratio, the thickness ratio and the Poisson ratio, that control the nature of the three dimensional stress distribution. Assuming that the fracture toughness is known for the layer within which the crack propagation takes place, a desired combination of the desired parameters can be determined to maximize the load carrying capacity of the laminate. M.M.M.

N79-32277*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ELEVATED-TEMPERATURE APPLICATION OF THE IITRI COMPRESSION TEST FIXTURE FOR GRAPHITE/POLYIMIDE FILAMENTARY COMPOSITES
B. Basava Raju, Charles J. Camarda, and Paul A. Cooper Washington Sep. 1979 48 p refs
(NASA-TP-1496; L-12704) Avail: NTIS HC A03/MF A01 CSCL 11D

Seventy-nine graphite/polyimide compression specimens were tested to investigate experimentally the IITRI test method for determining compressive properties of composite materials

at room and elevated temperatures (589 K (600 F)). Minor modifications were made to the standard IITRI fixture and a high degree of precision was maintained in specimen fabrication and load alignment. Specimens included four symmetric laminate orientations. Various widths were tested to evaluate the effect of width on measured modulus and strength. In most cases three specimens of each width were tested at room and elevated temperature and a polynomial regression analysis was used to reduce the data. Scatter of replicate tests and back-to-back strain variations were low, and no specimens failed by instability. Variation of specimen width had a negligible effect on the measured ultimate strengths and initial moduli of the specimens. Measured compressive strength and stiffness values were sufficiently high for the material to be considered a usable structural material at temperatures as high as 589 K (600 F).
A.R.H.

N79-32278# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.
MATHEMATICAL MODELING AND MICROMECHANICS OF FIBER-REINFORCED BIMODULUS COMPOSITE MATERIALS
Charles W. Bert Jun. 1979 23 p refs Part 1 presented at 15th Ann. Meeting of Soc. of Eng. Sci., Gainesville, Fla., 4-6 Dec. 1978. Part 2 proposed for presentation at ASME Winter Ann. Meeting, N. Y., Dec. 1979
(Contract N00014-78-C-0647; NR Proj. 064-609)
(AD-A071389; OU-AMNE-79-7; TR-1) Avail: NTIS HC A02/MF A01 CSCL 11/4

In Part I of this report are described and evaluated various mathematical constitutive equations proposed to model the mechanical behavior of fiber-reinforced composite materials having different compliances in tension and compression. Five different constitutive equations are described in detail and evaluated in the light of three criteria. In Part 2 of the report two entirely different micromechanistic approaches are developed to explain these observed differences in tension/compression behavior: the mean-fiber-angle approach originated by Tarnopol'skii et al., and the elastically supported tie-bar/column approach originated by Herrmann et al.
GRA

N79-32279# California Univ., Davis. Dept. of Mechanical Engineering.
FLOW AND FAILURE BEHAVIOR OF FIBER-REINFORCED EPOXY MATRIX POLYMERIC COMPOSITES Final Technical Report
A. K. Mjkherjee and D. Abercrombie 1977 68 p refs
(Contract W-7405-eng-48)
(UCRL-13895) Avail: NTIS HC A04/MF A01

The high temperature creep and tensile test behavior of continuously reinforced Kevlar PRD 49 III was investigated. The investigation was augmented by scanning electron microphotographs and acoustic monitoring of specimens. It is concluded that deformation is elastic and that failure occurs by stress and temperature assisted activated-breaking of primary bonds. This occurs at the worst flaw locations of the narrow distribution of flaws inherent to the fibers. Since the distribution of flaws is narrow, the failures are characteristically abrupt. The creep characteristics are excellent because normal creep loads are not high enough to activate sufficient numbers of flaws to instability. At these low loads, fiber breaks do not occur, and the creep rate continuously approaches zero as the fairly insignificant mechanism of creep is exhausted.
DOE

N79-32280# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Dept.
SCANNING ELECTRON MICROSCOPY OF FRACTURE SURFACES OF CARBON COMPOSITE MATERIALS
W. G. J. Hart Jan. 1979 30 p refs Sponsored by Netherlands Agency for Aerospace Programmes (NIVR)
(NLR-TR-76035-U) Avail: NTIS HC A03/MF A01

A macroscopic and microscopic study of composite fracture surfaces was performed in order to relate the fracture surface characteristics to the fracture mechanisms and types of loading involved. The microscopic study was performed on carbon composite fracture surfaces using the scanning electron microscope (SEM). To facilitate interpretation of the photographs, a theoretical treatment of the possible fracture processes expected to occur under the different loading conditions is presented. Results show that the SEM is a useful tool for examining fracture surface characteristics of composite materials failing under different loading conditions.
Author (ESA)

N79-32281# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
RESIDUAL STRENGTH PROPERTIES OF CARBON/EPOXY COMPOSITE MATERIALS
W. G. J. Hart Jan. 1979 42 p refs
(Contract NIVR-1744)
(NLR-TR-77039-U) Avail: NTIS HC A03/MF A01

Fatigue tests on unidirectional carbon/epoxy composite materials were performed to investigate whether previous fatigue loading influences the residual static strength. Residual strength tests were carried out on (0, + or - 45) sub 2s and (+ or - 45) sub 2s laminates, while for the (0, + or - 45) sub 2s laminate, the influence of previous tensile fatigue loading on the residual strength was investigated. Results show that the fatigue properties under tensile fatigue loading of unidirectional carbon/epoxy composite materials are excellent provided that the load introduction does not result in shear stresses.
Author (ESA)

N79-32282# Flachglass A.G. DELOG-DETAG, Gelsenkirchen (West Germany). Zentralabt. Forschung-Entwicklung.
DEVELOPMENT OF AN INDUSTRIAL PROCESS FOR THE PRODUCTION OF INDIUM OXIDE LAYERS FOR THE IMPROVEMENT OF THE K-VALUES OF INSULATING GLASS PANES Final Report
Hans Joachim Glaeser Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 50 p refs In GERMAN; ENGLISH summary Presented at Seminar 'Sonnenenergie', Bonn, 20-21 Sep. 1977
(Contract BMFT-03E-5001-A/ETS-0004-A)
(BMFT-FB-T-78-34) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 10,50

The use of highly transparent coatings of indium oxide with low emissivity to improve the thermal insulation of double glazing units as the result of a reduced radiation exchange was investigated. A coating process was tried, in which a partly oxidized In (80%)/Sn(20%)-alloy is applied by means of cathode sputtering followed by thermal oxidation and a treatment with forming gas. With such coatings a light transmission of 77% and a K-value of 2.0 W/m sq XK were obtained in double glazing structures during experiments on a semi-industrial plant (glass panes up to 1 x 1 m). However, a comparison of costs showed that the sputtering process will be more expensive than the sputtering of a single, extremely thin gold-layer which shows comparable characteristics.
Author (ESA)

N79-32283# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.
ENVIRONMENTAL FATIGUE CRACK PROPAGATION IN METAL/COMPOSITE LAMINATES
R. J. H. Wanhill Jun. 1978 24 p refs Submitted for publication
(NLR-MP-78027-U) Avail: NTIS HC A02/MF A01

Flight simulation fatigue crack propagation tests with gust spectrum loading were carried out on 2024-T3/carbon-epoxy, 7475-T761/carbon-epoxy, and Ti-6Al-4V/carbon-epoxy laminates with nominal weight savings of 30% as compared to equivalent 2024-T3 panels. The performance of the 2024-T3/carbon-epoxy laminates was much superior to those of the other material combinations. Overall, there was a fairly strong effect caused by changing from an environment of normal air to an air plus water spray environment. Probable reasons for this strong effect are discussed.
Author (ESA)

N79-32284# National Aerospace Lab., Amsterdam (Netherlands). Div. of Spaceflight Technology.
DETERMINATION OF THE THERMAL CONDUCTIVITY OF CARBON FIBER REINFORCED PLASTIC SHEET MATERIAL
D. vandenAssem and D. H. W. Daniels Apr. 1979 87 p refs
(Contract NIVR-1779)
(NLR-TR-77113-U) Avail: NTIS HC A05/MF A01

The determination of the thermal conductivity of anisotropic

carbon fiber reinforced plastic (CFRP) sheet material (thickness 0.3 mm) is described. For this purpose, two measuring set-ups were constructed, one for measurements in the plane of the sample and one for the measurement normal to the sheet plane. For the sheet material considered, the obtained measurement results show that in-plane : k = 6.4 (+ or -) 1.0 (+ or -) W/mK and that normal to the sheet k = 0.61 (+ or -) 0.18 W/mK. It is argued that modification of the apparatus for the in-plane measurements will give more accurate results. For the normal direction, however, improvement of the results is unlikely at the moment. Author (ESA)

N79-32285# National Aerospace Lab., Amsterdam (Netherlands). Div. of Spaceflight Technology.

THERMAL CONDUCTANCE MEASUREMENT OF HONEYCOMB SANDWICH PANELS WITH CARBON FIBER REINFORCED PLASTIC FACE SHEETS

D. vandenAssem and D. H. W. Daniels 3 Aug. 1978 40 p refs

(Contract NIVR-1779)

(NLR-TR-78081-U) Avail: NTIS HC A03/MF A01

The thermal conductance, normal to the plate direction, of 14 honeycomb sandwich material specimens with carbon fiber reinforced plastic face sheets was measured. Two different measurements set-ups were assembled; in one a guard specimen can be tested, in the other, the specimen is unguarded, so that corrections have to be made for the radiative heat exchange between the specimen and its environment. Two different face sheet thicknesses (100 micro m and 150 micro m) were used in the measurements, but no quantitative effect could be observed for the influence of thickness on the thermal conduction. An overall value for the conductivity, normal to the plate, was determined at about 326 K: C = 24.0 + or - 0.8 W/m sq x K, with a thermal gradient: dC/dT = (9.2 + or - 1.1) x 0.01 W/m sq x K sq. The indicated uncertainties are root-mean-square values. Author (ESA)

N79-32286# Research Inst. of National Defence, Stockholm (Sweden).

NONDESTRUCTIVE MEASUREMENT OF FIBER DIRECTION AND FIBER AMOUNT IN CARBON FIBER REINFORCED LAMINATES

Rolf Soederqvist and Ingvar Schill May 1979 18 p

(FOA-C-20306-F9) Avail: NTIS HC A02/MF A01

The X-ray diffraction patterns of the 002 graphite planes in carbon fiber reinforced plastics were measured. The intensity at azimuthal angle 0 from fiber normal was used for measurement of fiber amount and the azimuthal intensity distribution was used for measurement of fiber direction. Results show that with Mok alpha radiation, thickness from 0.5 mm to 15 mm can be measured with a precision of 2 percent as regards fiber amount and within 1 deg as regards fiber direction. Author (ESA)

N79-32287# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.

RESIDUAL STRENGTH OF (0, + OR - 45) SUB s AND (+ OR - 45, 0) SUB s CARBON/EPOXY LAMINATES

W. G. J. Hart 15 Jan. 1979 32 p refs

(Contract NIVR-1744)

(NLR-TR-77115-U) Avail: NTIS HC A03/MF A01

Residual strength tests were carried out on (0, + or - 45)sub s and (+ or - 45, 0)sub s carbon/epoxy laminates containing holes or cracks. The influence of specimen width on the residual strength was investigated for (0, + or - 45)sub s carbon/epoxy specimens. Results show that the residual strength is independent of the laminate stacking sequence for simulated cracks. The residual strength of (+ or - 45, 0)sub s and (0, + or - 45)sub s carbon/epoxy laminates containing holes is highest for the latter laminate configuration. Residual strength tests on (0, + or - 45)sub s carbon/epoxy specimens of different widths indicate that the residual strength behavior (corrected for finite width) is independant of the specimen width. Author (ESA)

N79-32288# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.

ENVIRONMENTAL FATIGUE CRACK PROPAGATION IN METAL/COMPOSITE LAMINATES Interim Report

R. J. H. Wanhill 15 Jan. 1979 26 p refs

(Contract NIVR-1806)

(NLR-TR-77122-U; IR-1) Avail: NTIS HC A03/MF A01

Flight simulation fatigue crack propagation tests with gust spectrum loading were carried out on 2024-T3/carbon-epoxy, 7475-T761/carbon-epoxy, and Ti-6Al-4V/carbon-epoxy laminates with nominal weight savings of 30 percent as compared to equivalent 2024-T3 panels. The performance of the 2024-T3/carbon-epoxy laminates was much superior to those of the other material combinations. Overall, there was a fairly strong effect noted when changing from an environment of normal air to an air plus water spray environment. Probable reasons for the strong effect are discussed. Author (ESA)

N79-32289# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.

RESIDUAL STRENGTH OF KEVLAR-CARBON/EPOXY HYBRID COMPOSITE MATERIALS

W. G. J. Hart 16 Jan. 1978 27 p refs

(Contract NIVR-1824)

(NLR-TR-78008-U) Avail: NTIS HC A03/MF A01

Residual strength tests were carried out on various Kevlar 49/carbon/epoxy laminate configurations consisting of a carbon/epoxy core with face sheets of Kevlar 49 fabric. The influence on the residual strength of fatigue loading notched specimens was investigated. Test data was then compared with data from similar tests on (0, + or - 45)sub s carbon/epoxy composite materials and aluminum alloys 2024-T3 and 7075-T6. Results show that the Kevlar fabric, with a high fracture strain, does not reduce the notch sensitivity of carbon/epoxy composites. Although 2024-T3 and 7075-T6 sheet material are less notch sensitive than composites for small defects, the absolute residual strength of composite materials remains higher. The fatigue properties of the notched laminates are also superior to those of 2024-T3 and 7075-T6, at least as far as constant amplitude tests are concerned. Author (ESA)

N79-32290# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.

RESIDUAL STRENGTH CHARACTERISTICS OF COMPOSITE REINFORCED STIFFENED PANELS

G. Bartelds 17 Feb. 1978 22 p refs

(Contract NIVR-1807)

(NLR-TR-78025-U) Avail: NTIS HC A02/MF A01

The effect of selective reinforcement, using unidirectional carbon-epoxy composites, on the residual strength of stiffened tensile panels of 7075-T6 aluminum alloy was investigated. A series of twelve specimens with varying degrees of stiffener reinforcement and containing various degres of initial damage were statically loaded to failure. The results can be interpreted in terms of the specific residual strength, that is, the ratio of panel failure load per unit width and panel mass per unit area. The specific residual strength increases with composite content of the stiffener and reaches a value for all-composite stiffening that is twice the value for an all-metal panel. Author (ESA)

N79-32291# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.

INVESTIGATION OF THE LENGTH DEPENDENCY OF CARBON FIBERS AND THE RELATED UNIDIRECTIONAL COMPOSITE STRENGTH

W. G. J. Hart Apr. 1978 38 p refs

(Contract NIVR-1744)

(NLR-TR-78050-U) Avail: NTIS HC A03/MF A01

To relate the strength of unidirectional composites to the strength of the constituent components, tensile tests were carried out on single carbon fibers of different lengths. Tensile tests on unidirectional and (0,90) carbon/epoxy were performed in order to examine whether the length/strength dependency of brittle fibers is also found in composite materials. Results show that the fiber strength strongly depends on the fiber length. However, the application of the Rule of Mixtures is shown to be debatable. The observed length/strength dependency in unidirectional carbon/epoxy specimens can be attributed to specimen splitting in the longer specimen, leading to premature failure. The application of a 90 deg layer in order to prevent splitting was not successful. Although the scatter in strength decreased, the experimental results were obscured by grip failures.

Author (ESA)

N79-32292# National Technical Information Service, Springfield, Va.
BORON REINFORCED COMPOSITES, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1976 - Apr. 1979
Diane M. Cavagnaro May 1979 244 p Supersedes NTIS/PS-78/0357; NTIS/PS-77/0364; NTIS/PS-76/0420; NTIS/PS-75/414; COM-74-10854
(NTIS/PS-79/0476/6; NTIS/PS-78/0357; NTIS/PS-77/0364; NTIS/PS-76/0420; NTIS/PS-75/414; COM-74-10854) Avail: NTIS HC $28.00/MF $28.00 CSCL 11D

The bibliography cites Federally-funded research on boron fibers and boron compounds used as reinforcing material in composites. Studies on fabrication, testing, uses, and structural and mechanical properties are included. (This updated bibliography contains 236 abstracts, 39 of which are new entries to the previous edition.) GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N79-32293 California Univ., Irvine.
LOW PRESSURE CHEMICAL IONIZATION STUDIES USING RAPID SCAN ICR SPECTROSCOPY Ph.D. Thesis
Richard Leon Hunter 1979 392 p
Avail: Univ. Microfilms Order No. 7920929

A computer controlled ion cyclotron resonance (ICR) spectrometer was constructed utilizing the recently developed capacitance bridge detector (CBD) as a replacement for the traditional marginal oscillator detector. The CBD allows mass spectra to be recorded at constant magnetic field strength by scanning the excitation frequency to bring ions of different m/z into resonance. A rapid scan ICR detection scheme allows a mass spectrum from m/z 20 to m/z 1000 to be acquired in just 14.5 s rather than about 3000 s required when using a marginal oscillator detector. The acquired signals are badly distorted, but a true mass spectrum can be recovered by applying a cross-correlation technique to the data. Examples are presented illustrating how low pressure chemical ionization can be applied to the study of low volatility and temperature sensitive biomolecules including amino acids, DNA and RNA bases, nucleosides, and monosaccharides. Dissert. Abstr.

N79-32294 Rice Univ., Houston, Tex.
SEMICONDUCTING PROPERTIES OF PASSIVE FILMS ON TIN IN SLIGHTLY ALKALINE SOLUTIONS Ph.D. Thesis
Sergio Daniel Kapusta 1979 250 p
Avail: Univ. Microfilms Order No. 7919600

The semiconducting properties of the different passive films grown anodically on tin in slightly alkaline solutions were studied in relation to the electrochemical behavior of the metal. The dielectric dispersion of the passive film is explained in terms of a complex dielectric constant associated with a flat distribution of relaxation times. The electron transfer kinetics between a redox couple in solution and the passive electrode are satisfactorily explained by a quantum mechanical treatment of electron tunneling through a potential barrier formed at the electrode surface. Results from photoresponse experiments indicate that the band structure inside the oxide is not exactly that described by the band model of solids. Consequently, a more realistic model should be based on a distribution of energy levels on both sides of the metal oxide/electrolyte solution interface. Dissert. Abstr.

N79-32295 Maryland Univ., College Park.
THE ABSOLUTE ISOTOPIC ABUNDANCE AND ATOMIC WEIGHT OF THALLIUM Ph.D. Thesis
Lura Powell Dunstan 1978 142 p
Avail: Univ. Microfilms Order No. 7920752

The atomic weight of thallium was determined by mass spectroscopy. A high precision assay technique was developed so that accurately known quantities of the Tl-203 and Tl-205 separated isotopes could be mixed to produce standards for calibration of the mass spectrometer. This assay technique involved the gravimetric determination of 99.3 percent of the thallium as Tl_2CrO_4. The soluble thallium was then aliquoted and determined by isotope dilution mass spectrometry. A tungsten filament surface ionization technique was developed for the determination of precise isotope abundance measurements. This technique allowed isotopic analysis of the separated isotopes, calibration standards, and a natural thallium reference standard with precisions of better than 0.1 percent. The Tl-205/Tl-203 absolute isotopic abundance ratio of the reference sample was 2.38714 + or - 0.00103, yielding an atomic weight of 204.38333 + or - 0.00018. Dissert. Abstr.

N79-32296 Massachusetts Univ., Amherst.
ELECTROANALYTICAL APPLICATIONS OF RETICULATED VITREOUS CARBON ELECTRODES Ph.D. Thesis
Arthur Neil Strohl 1979 178 p
Avail: Univ. Microfilms Order No. 7920900

Porous electrodes for use in flowing streams were fabricated from reticulated vitreous carbon (RVC). The resistance to solution flow of an electrode was low and flow rates up to 40 mL/min were attained. Microgram and submicrogram amounts of ferricyanide, catechol, hydroquinone, ascorbic acid in vitamin C tablets, and epinephrine were determined by controlled potential coulometry using the flow-through electrode. In many instances, results were accurate and precise to 5 ppt relative. The RVC electrode was demonstrated to be a useful detector for flow injection analysis in both an amperometric and a coulometric mode of operation. A relative precision of a few ppt was achieved in the latter mode, but the sampling rate was limited to about 24 samples per hour. With amperometric operation, sampling rates as high as 264 samples per hour were achieved with a relative precision slightly better than 1%. In a potentiometric mode, RVC was demonstrated to be responsive to solution acidity. Possible reasons for the response were examined. Dissert. Abstr.

N79-32297 State Univ. of New York Coll. of Environmental Science and Forestry, Syracuse.
LASER DOPPLER ELECTROPHORESIS AND THE MOBILITY OF COLLOIDAL PARTICLES Ph.D. Thesis
John Randolph Goff 1979 531 p
Avail: Univ. Microfilms Order No. 7920310

Along with a detailed discussion of the principles and experimental parameters of the reference beam technique, a comparison is made with the dual beam technique, used chiefly in laser Doppler anemometry. Original electronic circuitry for producing square-wave current waveforms for the electrophoresis cell electrodes is described. The mobility trends predicted on the basis of this theory agree qualitatively with the experimental data, and the assumption of surface conductance brings the data and theory even more closely in accord. These developments are followed by specific discussions of the various types of u log c behavior encountered in the data. Dissert. Abstr.

N79-32298 Massachusetts Univ., Amherst.
INVESTIGATION OF THE LIQUID-LAYER-ON-SOLID SAMPLE SPARK TECHNIQUE Ph.D. Thesis
Robert James Coraor 1979 429 p
Avail: Univ. Microfilms Order No. 7920831

The liquid-layer-on-solid sample spark technique involves the application of a thin dielectric, usually water, onto the planar electrode of a high voltage spark discharge in the point-to-plane configuration. Measurements of this liquid layer indicate it to be approximately 10 microns thick. The addition of this layer to the discharge results in an increase in sample melting and vaporization caused by a constriction of the spark channel. Direct evidence of the constriction is presented and is shown to occur for single current half-cycles. The liquid layer constriction appears to be roughly 0.5 mm in diameter based on studies of physically constricted discharges. An increase in the velocity of the propagation of electrode material into the analytical gap also occurs as a result of the constriction. The amount of sample vaporization was shown to be proportional to the dielectric constant of the layer for solutions of ethanol and water. Evidence

also suggests it is inversely proportional to the layer thickness.
Dissert. Abstr.

N79-32299 Pennsylvania Univ., Philadelphia.
COMBUSTION OF UNIFORMLY SIZED DROPLET SPRAYS IN A REFRACTORY TUBE Ph.D. Thesis
Byung Chang Choi 1979 147 p
Avail: Univ. Microfilms Order No. 7919438

Stable flame from the mixture of uniformly sized fuel droplets and air was detected experimentally. This system produced very low values of NOx ranging from 11 to 24 ppm (as NO). A one dimensional model was developed and solved for the combustion of a mixture of gaseous fuel and air, and of uniformly sized fuel droplets and air in the regime of turbulent flow in a refractory tube. Global rate expressions for the formation of NOx and CO were integrated numerically. However, the predicted value of CO was lower than the measured value by several orders of magnitude. The NOx prediction agreed with the data only in magnitude. These discrepancies are undoubtedly due to defects in the present knowledge of free radical mechanisms.
Dissert. Abstr.

N79-32300 Princeton Univ., N. J.
ON THE ELECTRICALLY STIMULATED FILTRATION OF AEROSOLS Ph.D. Thesis
Daniel Joseph OMeara, Jr. 1979 258 p
Avail: Univ. Microfilms Order No. 7920419

The effects of fiber shape, electric field orientation, fiber volume fraction and particle collector forces on the capture of small particles on large fibers are investigated. The effects of fiber shape and electric field orientation are investigated for charged and uncharged particle collection on multilobed fibers. The maximum enhancement of collection occurs when the electric field is oriented perpendicular to both the gas flow and the cylinder axes. Fiber lobes generally enhance collection and for conducting fibers collection is concentrated on the lobes. Flow past a pair of cylinders is analyzed using the Oseen equations. An extensive investigation of the eddies which occur at close spacings is discussed. Drag and lift forces are calculated for flow parallel to the line of centers and for flow perpendicular to the cylinder axes. Dissert. Abstr.

N79-32301 Lehigh Univ., Bethlehem, Pa.
STUDIES IN ELECTROCHEMISTRY. 1: MICROPROCESSOR CONTROLLED ELECTROCHEMISTRY. 2: THIAMINE ELECTROCHEMICAL OXIDATION REACTIONS Ph.D. Thesis
George Edward Barringer 1979 120 p
Avail: Univ. Microfilms Order No. 7919969

A microprocessor controlled electrochemical system is described which replaces conventional waveform generators and data display and storage devices. The system is constructed from available components and is adaptable for use in many electrochemical techniques. The system is designed to utilize a minimum of hardware parts and is a software oriented system. The instrument performs cyclic voltammetry but is adapted for use in controlled potential electrolysis, chronopotentiometry, or other electrochemical techniques. The oxidation at solid platinum electrodes of vitamin B1, thiamine, to thiochrome was chosen as a test system for the microprocessor electrochemical system. Thiamine is oxidized to thiochrome in aqueous solutions in unbuffered solutions. A coupled chemical electron transfer reaction is hypothesized. Dissert. Abstr.

N79-32302 Wisconsin Univ. - Madison.
MEASURED EFFECTS OF BOUNDARY CONDITIONS ON OXIDES OF NITROGEN PRODUCED BY LIQUID FUEL DIFFUSION FLAMES Ph.D. Thesis
Dennis Roy Jaasma 1978 222 p
Avail: Univ. Microfilms Order No. 7902408

Liquid fuel diffusion flames burning in a low velocity gas stream under ambient pressure were studied experimentally. Porous spheres of 1 to 6 mm diameter, porous cylinders of 3.6 to 6.7 mm diameter, and a moving thread of 0.22 to 0.46 mm diameter were wetted with fuel to provide different liquid surface geometries around which flames were established. The conditions varied were approach stream velocity, temperature, oxygen concentration, and unburned hydrocarbon concentration. Methanol, ethanol, n-pentane, and n-heptane were used as fuels. Fuel temperature was varied from 25 degrees C to the boiling point of the fuel. Burning rates and oxides of nitrogen emission indices were obtained for the various geometries and conditions. Comparison of the data to calculate emission indices in the literature for spherically symmetric flames around droplets showed that such models are not suitable for flames such as the ones studied. The models' neglect of convection effects and detailed kinetics are probably the reasons for the disagreement between the data and the calculations. Dissert. Abstr.

N79-32303*# Notre Dame Univ., Ind. Dept. of Aerospace and Mechanical Engineering.
FEASIBILITY STUDY OF LIQUID POOL BURNING IN REDUCED GRAVITY Final Report, Jul. 1977 - Feb. 1979
A. Murty Kanury Sep. 1979 79 p refs
(Contract NAS3-21018)
(NASA-CR-159642; TR-79-1) Avail: NTIS HC A05/MF A01 CSCL 21B

The feasibility of conducting experiments in the Spacelab on ignition and flame spread with liquid fuel pools which are initially at a temperature lower than the fuel's flash point temperature was studied. Theories were developed for the ignition and flame spread processes, and experiments were conducted to understand the factors influencing the ignition process and the spread rate. The results were employed to devise a conceptual Spacelab experiment which is expected to be feasible for a safe conduct and to be suitable for obtaining crucial data on the concerned processes. K.L.

N79-32304# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
NANOGRAM TECHNIQUES. 2: MICROSCALE PREPARATIVE GAS CHROMATOGRAPHY
I. Klimes, W. Stuenzi, and D. Lamparsky 1979 23 p refs
Transl. into ENGLISH from J. Chromatogr. (Netherlands), v. 136, 1977 p 23-36
(NRC/CNR-TT-1951; ISSN-0077-5606) Avail: NTIS HC A02/MF A01

The methods used for a nearly quantitative recovery of injected materials are described. Different parameters were evaluated in order to find the best suited operation conditions. The use of capillary tubes as trapping vials give good results if the tube is filled with small cotton pieces and cooled by means of a mixture of dry ice and liquid nitrogen. The full range of resolution power given by the packed analytical or even the capillary GLC columns for preparative purposes can be utilized in comparison to the normal preparative gas-liquid chromatographic methods.
M.M.M.

N79-32305# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
NANOGRAM TECHNIQUES. 1: INJECTION WITHOUT LOSSES ON CAPILLARY COLUMNS
I. Klimes, W. Stuenzi, and D. Lamparsky 1979 15 p refs
Transl. into ENGLISH from J. Chromatogr. (Netherlands), v. 136, 1977 p 13-21
(NRC/CNR-TT-1950; ISSN-0077-5606) Avail: NTIS HC A02/MF A01

A simple double-cone device, prepared from a glass capillary tube and placed in the injection port on top of a glass capillary gas-liquid chromatographic column, enables the injection of the total amount of material on to the column without losses by by-pass splitters. A syringe with lengthened piston permits the injection of material without prior dilution. This modified syringe is also well suited for handling of head-space samples and for rapid detection of polarity of unknown components in the analyzed substrate. A.R.H.

N79-32306# Rochester Univ., N. Y.
EXPERIMENTAL STUDIES OF VALENCE INSTABILITIES Final Report, 22 Mar. 1976 - 21 Mar. 1979
R. D. Parks Jun. 1979 8 p
(Grant DAAG29-76-G-0171)
(AD-A070352; ARO-13428.1-P) Avail: NTIS HC A02/MF A01 CSCL 22/2

The research accomplished is summarized in abstracts of five Ph.D theses which were completed during the period:

(1) Experimental Studies of the Ce(1-x)Th(x) Valence Instability; (2) Experimental Studies of Two Kondo Lattice Systems CeAl(2) and Ce(1-x)Th(x); (3) Calorimetric Studies of a Cerium Alloy and a Cerium Intermetallic: Ce(1-x)Th(x) and CeAl(2); (4) Transport Studies of Cooperative Phenomena in Rare Earth Based Systems; and (5) The Valence Instability in Cerium-Based Alloy Systems. GRA

N79-32307# National Bureau of Standards, Washington, D. C. Surface Science Div.

PHOTOEMISSION STUDIES OF H2S, H2, AND S ADSORBED ON Ru(110): EVIDENCE FOR AN ADSORBED SH SPECIES

Galen B. Fisher May 1979 24 p refs

(Contract N00014-79-F-0014)

(AD-A070054; TR-13) Avail: NTIS HC A02/MF A01 CSCL 07/4

H2S, H2 and S adsorbed on Ru110 were studied by angle-integrated ultraviolet photoemission (UPS) as part of a study of the effect of adsorbed sulfur, a common catalytic poison, on this Ru surface. For low exposures of H2S at 80 K, the work function rises to a value 0.16 eV above that of clean Ru110 while the associated UPS spectra exhibit features similar to those of H(ads) and S(ads) and different from those of molecular H2S. We conclude that H2S dissociates completely at low coverages on Ru110 at 80 K. At intermediate exposures the work function drops and the UPS spectra show new features which are attributed to the presence of an adsorbed SH species. This appears to be the first direct observation of this surface complex. At higher exposures the work function saturates at a value 0.36 eV below the clean value; the UPS spectra change markedly and indicate the adsorption of molecular H2S. Heating adsorbed H2S leaves a stable layer of S(ads) on Ru110. The surface with adsorbed sulfur strongly modifies the adsorption at 80 K of a number of molecules relative to the clean Ru110 surface. Author

N79-32308# Ohio State Univ. Research Foundation, Columbus.

KINETICS OF THE DISPLACEMENT REACTION BETWEEN Fe AND Cu2O AT TEMPERATURES BETWEEN 800 AND 1050 DEGREES C Progress Report, 15 Dec. 1974 - 15 May 1979

G. J. Yurek (MIT), Robert A. Rapp, and John P. Hirth 15 May 1979 33 p refs

(Contract N00014-75-C-0541; NR Proj. 036-047)

(AD-A070664; OSURF-760222/784098-17) Avail: NTIS HC A03/MF A01 CSCL 11/6

The products of the displacement reaction between solid iron and CU2O in the temperature range of 800 to 1050 C are solid copper, wustite and magnetite. The product oxide in contact with the iron phase is in the form of rods embedded in a matrix of copper. A thin layer of copper separates the oxide rods from the CU2O phase. The rates of growth of the product phases are controlled by solid-state counterdiffusion of oxygen and iron through the product phases, except for the initial stage of the reaction. A previously developed kinetic model for the diffusion-controlled growth of the product phases is employed to calculate the rates of growth of each of the product phases. Theoretical values of growth rates are in excellent agreement with experimental values for temperatures above 905 C. Below 950 C, the mechanism for the growth of the magnetite phase changes, which yields marked differences between the experimental and theoretical rates of growth. The mechanism for the displacement reaction below 950 C has not been determined. GRA

N79-32309# Colorado Univ. at Boulder. Dept. of Chemistry.

INFRARED CHEMILUMINESCENCE STUDIES OF ION-MOLECULE REACTIONS IN A FLOWING AFTERGLOW Interim Technical Report, 1 Apr. 1978 - 31 Mar. 1979

Stephen R. Leone, G. Barney Ellison, and Veronica M. Bierbaum Mar. 1979 16 p refs

(Grant AF-AFOSR-3565-78; AF Proj. 2303)

(AD-A070068; AFOSR-79-0727TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

A flowing afterglow apparatus for infrared chemiluminescence studies of ion-molecule reactions has been successfully constructed, made operational, and two key new experiments completed in the first year of this grant. Figure 1 illustrates the major components of this device. The apparatus consists of a gas handling system, a stainless steel flow tube in which ion production and reaction occur, an infrared detection system with signal averaging equipment for monitoring vibrational chemiluminescence, a quadrupole mass filter for analysis and detection of the ionic species, and a 1600 CFM Roots blower backed by a mechanical pump for maintaining the large gas flow velocities. Author (GRA)

N79-32310# California Univ., Livermore. Lawrence Livermore Lab.

COMPUTER AUTOMATION OF CONTINUOUS-FLOW ANALYZERS FOR TRACE CONSTITUENTS IN WATER. VOLUME 4: DESCRIPTION OF PROGRAM SEGMENTS. PART 1: TAAIN

R. W. Crawford 18 Jan. 1979 48 p

(Contract W-7405-eng-48)

(UCRL-52532-Vol-...-Pt-1) Avail: NTIS HC A03/MF A01

The computer program TAAIN, the first in the series of programs necessary in automating the technicon autoanalyzer is described. A flow chart and sequence list that describes and illustrates each logical group of coding, and a description of the contents and functions of each section and subroutine in the program is included. In addition, all arrays, strings, and variables are listed and defined, and a sample program listing with a complete list of symbols and references is provided. DOE

N79-32311# Department of Energy, Morgantown, W. Va. Energy Technology Center.

KINETICS AND REACTION PRODUCTS OF AEROBIC PYRRHOTITE (FeS) HYDROLYSIS AT AMBIENT TEMPERATURES

G. D. Case, W. L. Farrior, D. A. Green, and G. W. Stewart Mar. 1979 38 p refs

(METC/RI-79/3) Avail: NTIS HC A03/MF A01

The product distributions and mechanisms of FeS hydroloysis were examined as a function of pH, NH4+ ion concentration, and SO2/sulfite concentrations in aqueous suspensions. Products in the solution phase as well as precipitates and starting material residues were examined by pH and redox potentiometry, X-ray diffraction, X-ray fluorescence, scanning electron microscopy, infrared spectrometry, and wet chemical methods. Principal products of pyrrhotite hydrolysis includes soluble SO4/sup = /, Fe2+, and lepidocrocite (FeOOH). In an unbuffered acid medium, equimolar leaching of iron and sulfur from FeS gives these plus some evolved H2S as the only products. DOE

N79-32312# California Univ., Berkeley. Lawrence Berkeley Lab.

REDUCTION OF NITRIC OXIDE BY CARBON MONOXIDE OVER A SILICA SUPPORTED PLATINUM CATALYST: INFRARED AND KINETIC STUDIES Ph.D. Thesis

D. H. Lorimer Jul. 1978 169 p refs

(Contract W-7405-eng-48)

(LBL-8007) Avail: NTIS HC A08/MF A01

The reduction of nitric oxide by carbon monoxide over a 4.5 weight percent platinum catalyst supported on silica was studied at 300 C. Reaction rate data were obtained together with in situ infrared spectra of species on the catalyst surface. The kinetics of the system were found to exhibit two distinct trends, depending on the molar ratio of CO/NO in the reactor. For net reducing conditions (CO/NO greater than 1) the catalyst underwent a transient deactivation, the extent of which was dependent on the specific CO/NO ratio during reaction. Reactivation of the catalyst was obtained with both oxidizing and reducing pretreatments. A reaction mechanism based on the dissociation of nitric oxide as the rate-limiting step was used to correlate nitric oxide reaction rates and nitrous oxide selectivities observed under reducing conditions. The nitric oxide reaction rate was found to be first order in nitric oxide partial pressure, and inverse second order in carbon monoxide partial pressure. A mechanism is proposed to qualitatively explain the deactivation process observed under reducing conditions. DOE

N79-32313# Sandia Labs., Livermore, Calif.

COMPUTATIONAL NATURE OF COMBUSTION MODELING

R. J. Kee Jul. 1978 52 p refs

(Contract EY-76-C-04-0789)
(SAND-78-8245) Avail: NTIS HC A04/MF A01

An overview is given which describes the role of computational modeling in combustion research. The modeling effort is divided into two broad subgroups-fundamental processes and systems simulation-which are amenable to computational solution. The study of fundamental processes is addressed primarily at understanding complex chemical kinetic interactions while systems simulation seeks primarily to quantify complicated hydrodynamic behavior. Even though the two approaches seek to predict different aspects of combustion phenomena, they share a number of common computational difficulties. Four such areas are identifed and the scope of the mathematical problems are outlined. These topics are operator-splitting, stiff differential equations, coordinate systems and resolution and iterative minimization techniques.
DOE

N79-32314# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
EARLY FORMATION OF NITROGEN OXIDES DURING COMBUSTION OF HYDROCARBONS M.S. Thesis - Paris Univ.
Nicole Avezard 1978 83 p refs In FRENCH; ENGLISH summary Translation is in process as ESA-TT-579
(ONERA-NT-1978-4) Avail: NTIS HC A05/MF A01

The theoretical schemes determining the early NO concentrations were verified by comparison with experimental results obtained in a stirred combustor. The influence of water vapor on early NO formation, from both the experimental and theoretical viewpoints, is also emphasized. The experimental early NO, concentration in a Longwell type combustor, was determined to be the difference between the experimental NO and the thermal NO calculated using the Zeldovich mechanism, while taking into account an over-equilibrium of 0. A process involving HCN is suggested as an explanation of the phenomenon. The Miyauchi model, complemented by the Jachimowski reactions, accounts exactly for the experimental early NO with a residence time on the order of 1 ms; for higher residence times, the calculation is much more complex. Results on the influence of water on nitrogen oxides are presented. Calculations made it possible to determine this effect, which is essentially thermal for lean mixtures; it is more complex for rich mixtures. Author (ESA)

N79-32315# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
INFLUENCE OF TURBULENCE ON HYDROCARBON COMBUSTION IN A STIRRED COMBUSTOR Ph.D. Thesis - Paris Univ.
Claude Bonniot 1978 54 p refs In FRENCH; ENGLISH summary Translation is in process as ESA-TT-580
(ONERA-NT-1978-7) Avail: NTIS HC A04/MF A01

The reciprocal influence of turbulence and of combustion in the simple case of homogeneous turbulence, which corresponds to the primary zone of turbomachine combustors, was determined. A calculation method was developed; it allows, through reasonable simplifying assumptions, the calculation of the statistic characteristics of the flame. Experiments were carried out on a stirred at large scale combustor. The results of optical temperature measurements showed that the combustor presented good homogeneity. A maximum was determined for the characteristics mixing time, and this maximum is much lower than the mean residence time in the combustor. The influence of equivalence ratio fluctuations at injection was also studied. A simple calculation makes it possible to predict these ratios in the case of fluctuations with a low frequency relative to residence time; in the case of high frequency fluctuations, the calculation-experiment agreement is good qualitatively, but not quantitatively. Author (ESA)

N79-32316# National Physical Lab., Teddington (England). Div. of Chemical Standards.
CORRELATION AND ESTIMATION OF VAPOR-LIQUID CRITICAL PROPERTIES. PART 2: CRITICAL PRESSURES AND CRITICAL VOLUMES OF ORGANIC COMPOUNDS
D. Ambrose May 1979 48 p refs
(NPL-Chem-98) Avail: NTIS HC A03/MF A01

A method of correleting critical temperatures was established. The method is extended to critical pressures and critical volumes, utilizing for these properties the methods of correlation proposed by Lydersen. Numerous determinations of critical properties have been made since Lydersen's work was published and as a result some additions and minor modifications to the original scheme of increments are proposed. A point of difference between this presentation and its predecessor is that the structure of alkanes is expressed differently and the increments for these compounds, both for critical pressures and critical volumes, were obtained by least squares analysis by computer. This method was also used with the values of Y and V for the haloalkanes for determination of the increments for halogens. In general, the methods described follow the same pattern as the earlier critical temperature correlation. Author (ESA)

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N79-32317 Pittsburgh Univ., Pa.
COMPUTER MODELING OF FILM GROWTH AND RESISTANCE ESTIMATION OF SEMI-CONTINUOUS METAL FILMS Ph.D. Thesis
Kuang-Yeh Chang 1978 157 p
Avail: Univ. Microfilms Order No. 7917448

A method is developed to simulate by digital computer the growth of thin films on amorphous substrate surfaces after the initial nucleation stage. The simulated area coverage versus film thickness curve follows the experimental data very closely initially. When film thickness increases, the curve resulting from the simulation shows lower values of surface coverage than the experimental data. The reason is that flattening of films during coalescence was neglected in the simulation. The simulation predicts the correct range of area coverage where the onset of ohmic conduction occurs. The calculated resistance is lower than the experimentally measured data. The discrepancy results from the use of Fuchs' theory which neglects the effects of enhanced electron scattering from grain boundaries, impurities, and defects in thin films. Dissert. Abstr.

N79-32318 Drexel Univ., Philadelphia, Pa.
ROLE OF DEFORMATION PROCESSING ON THE FATIGUE BEHAVIOR OF A HIGH STRENGTH POWDER METALLURGY ALUMINUM ALLOY Ph.D. Thesis
Harry William Antes 1979 216 p
Avail: Univ. Microfilms Order No. 7920810

Tension-tension axial fatigue as well as fatigue crack propagation tests (R=+0.1) were run in air and 3 1/2% NaCl solution salt-fog environments to determine the portion of the S-N curves between 60 ksi and 70 ksi. Weibull analysis of the data was used to establish the median life S-N curves. In air, increasing local deformation increased the longitudinal properties while there was little change in the short transverse properties. Testing in salt-fog caused a considerable reduction in both longitudinal and short transverse fatigue life. In salt-fog, increasing local deformation had little effect on longitudinal properties but short transverse properties decreased with increasing local deformation. Thus fatigue life anisotropy increases in both air and salt-fog with increasing deformation. In air it is caused by an enhancement in longitudinal properties while in salt-fog it is the result of a short transverse property degradation. Dissert. Abstr.

N79-32319 Texas Univ. at Austin.
FATIGUE BEHAVIOR OF TiNi ALLOY Ph.D. Thesis
Emilio Mendoza 1979 121 p
Avail: Univ. Microfilms Order No. 7920173

The fatigue mechanism and crack formation in TiNi specimens cycled in tension-compression at temperatures above, below and inside the martensitic transition temperature range (TTR), were studied using replicas and thin films in the electronic microscope. Two different materials, a high transition temperature range (HTTR) and a low transition temperature range (LTTR) material with TTR's of 38/54 C and 15/38 C respectively, were used. The fatigue behavior of the TiNi was best at the high temperature phase when the material is completely in the cubic phase. The alloys responded uniquely in the low temperature phase. The

HTTR material hardened then saturated while the LTTR material hardened then softened. Unidirectional and cyclic straining affected the TTR of the material when the strain was greater than 8% and 4.5% respectively. Dissert. Abstr.

N79-32320 State Univ. of New York at Stony Brook.
A MICROSTRUCTURAL INVESTIGATION OF PLASMA-SPRAYED METAL AND OXIDE COATINGS Ph.D. Thesis
Saed Safai 1979 267 p
Avail: Univ. Microfilms Order No. 7919359

X-ray and electron micrographic methods were used to characterize the metastable nature of as-sprayed coatings and the role of post-spray heat treatments. The effect of process-related parameters such as spraying distance and coating thickness on the microstructure of plasma-sprayed aluminum and aluminum oxide was studied. The effect of alloying elements such as TiO2 on the grain morphology and structure of the aluminum oxides coatings was also examined. It was found that through proper selection of alloying additions, coatings with more homogeneous microstructure and lower porosity can be deposited, which may not be obtained by controlling the spray parameters. The pore morphology and size distribution was examined by porosimetry and correlated to the fracture mechanisms in the sprayed coatings. The grain morphology was found to be related to the cooling rate and heat extraction through the substrate. In addition, the reaction of the molten particles with the gaseous environment was considered. Dissert. Abstr.

N79-32321 Polytechnic Inst. of New York.
LOW CYCLE FATIGUE BEHAVIOR OF Ti-Mn ALLOYS Ph.D. Thesis
Yousef Saleh 1979 301 p
Avail: Univ. Microfilms Order No. 7920801

Seven Ti-Mn alloys were used to study the effect of volume fraction of phases, morphology and grain size on low cycle fatigue behavior of two phase Ti alloys. The alloys contained between 0.4 and 15.4 wt % Mn and were heat treated to produce different volume fractions of the alpha and beta phases while the composition of each phase was kept constant. Reloading yield points were observed in beta Ti-Mn alloys and were investigated. Aging yield points were also present in the beta alloys and the magnitude of both yield points could reach the same value at room temperature. The magnitude of the reloading yield drop depends on the temperature, strain rate, and prior strain. Dissert. Abstr.

N79-32322 Pennsylvania Univ., Philadelphia.
THE EFFECTS OF COMPOSITION AND CARBIDE PRECIPITATION OF TEMPER EMBRITTLEMENT OF 2 1/4 Cr-1 Mo STEELS Ph.D. Thesis
Jin Yu 1979 389 p
Avail: Univ. Microfilms Order No. 7919536

Temper embrittlement of 9/4 Cr-1 Mo steel was studied systematically in terms of the effects of P, Sn, Mn and Si. It was shown that the principal role of Mo is to suppress embrittlement, due to the strong interaction between Mo and P, which presumably leads to compound formation, thereby diminishing P segregation. However, due to the strong interaction between Mo and C, Mo is precipitated as carbide (M2,C) during tempering or aging, and the matrix is depleted of Mo. Therefore, P segregation follows in a manner consistent with the rate of M2C precipitation. Dissert. Abstr.

N79-32323# Aluminum Co. of America, Alcoa Center, Pa. Engineering Properties and Design Div.
SELECTING ALUMINUM ALLOYS TO RESIST FAILURE BY FRACTURE MECHANISMS
R. J. Bucci 1 Sep. 1978 57 p refs Revised
(Alcoa-57-77-24-Rev) Avail: NTIS HC A04/MF A01

Useful information and guidelines are presented for engineers who wish to minimize fracture problems in aluminum engineering structures through better application of materials knowledge and optimum alloy choice. Consideration is given to methods and examples of characterizing fracture resistance of aluminum alloys including interpretations of data addressing basic design approaches. Specific attention is given to trade-offs among properties of strength, fracture toughness, corrosion, stress corrosion cracking, and fatigue in structural aluminum materials. Author

N79-32324*# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
LOW CYCLE FATIGUE PROPERTIES OF MAR-M-246 HI IN HYDROGEN Final Report
John R. Warren Jun. 1979 23 p
(Contract NAS8-33109)
(NASA-CR-161296; FR-11852) Avail: NTIS
HC A02/MF A01 CSCL 11F

The transverse, low cycle fatigue properties were determined for directionally solidified and single crystal samples of a cast nickel-base alloy proposed for use in space propulsion systems in pure or partial high pressure hydrogen environments at elevated temperatures. The test temperature was 760 C (1400F) and the pressure of the gaseous hydrogen was 34.5 MPa (5000 psig). Low cycle fatique life was established by strain controlled testing using smooth specimens and a servohydraulic closed-loop test machine modified with a high pressure environmental chamber. Results and conclusions are discussed. A.R.H.

N79-32325*# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
EVALUATION OF CANDIDATE METALS IN A SIMULATED SPACE SHUTTLE MAIN ENGINE ENVIRONMENT FOR APPLICATION AS TURBINE BLADE DAMPERS Final Report
Leonard H. Caveny and Samuel O. Morris May 1979 37 p refs
(Contract NAS8-33102)
(NASA-CR-161299; MAF-1436) Avail: NTIS
HC A03/MF A01 CSCL 11F

The high-pressure pumps for the space shuttle main engine are driven by combustion products which are 50 percent H2 and 50 percent H2O (by weight). The Haynes alloy 188, used in the dampers, experienced erosion. The erosion producing characteristics of wet H2 were evaluated using a controlled environment produced by a ballistic compressor. Four candidate materials were evaluated: H-188, A-286, Pt/Rh and Rh. Rh was clearly the most erosion resistant. Comparisons with AISI 4340 and Fe specimens of known uniformity indicate that metallurgical defects in the candidate materials are primary contributors to the higher than usual erosion. G.Y.

N79-32326*# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
DEVELOPMENT OF SPUTTERED TECHNIQUES FOR THRUST CHAMBERS Final Report
J. R. Mullaly and P. A. Allard Mar. 1979 96 p refs
(Contract NAS3-20377)
(NASA-CR-159637; FR-11409) Avail: NTIS
HC A05/MF A01 CSCL 11F

The 0.152 cm thick sputtered and copper deposits were electron beam welded to wrought copper. Tensile specimens were machined from the weld assemblies and tested at room temperature. Tensile strength approached the strength of wrought material. Elongations up to 25% were measured. Sputtered aluminum was used to fill 0.157 cm wide by 0.127 cm deep grooves in thrust chamber spool piece liners. The liners were closed out by sputtering copper from post and hollow cathodes. Author

N79-32327# Naval Ship Research and Development Center, Bethesda, Md.
FATIGUE FAILURE PREDICTION BY X-RAY DOUBLE CRYSTAL DIFFRACTOMETRY
R. N. Pangborn, S. Weissman, and I. R. Kramer Jun. 1979 20 p refs
(ZR0220101)
(AD-A070296; DTNSRDC-79/063) Avail: NTIS
HC A02/MF A01 CSCL 11/6

X-ray double crystal diffractometry and reflection topography were employed to examine the deformation response of single crystals and Al 2024 alloy specimens. A propensity for work hardening in the surface layers compared to the bulk material was demonstrated for both tensile-deformed and fatigue-cycled metals. The cyclically induced defect distribution with depth from the specimen surface was also investigated as a function of the fraction of fatigue life. This led to a capability for predicting the fatigue life and failure by a nondestructive X-ray diffraction method. Author (GRA)

fatigue life and failure by a nondestructive X-ray diffraction method. GRA

N79-32328# Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
HYDROGEN PERMEATION IN IRON AT LOW TEMPERATURES M.S. Thesis
Michael Surkein and Robert H. Heidersbach, Jr. Mar. 1979 105 p refs
(Grant DAAG29-76-G-0311)
(AD-A070309; TR-1; ARO-14057.3-MS) Avail: NTIS HC A06/MF A01 CSCL 11/6

This report contains the manuscript of a thesis by M. Surkein, MS candidate in Ocean Engineering at the University of Rhode Island. A study of concentration, thickness and temperature effects on hydrogen permeation in iron was conducted. This study was performed using a gas phase hydrogen charging technique. Initial experiments were to observe the permeation fluxes to see if steady states were reached. Once steady states were reached, the effects of electroplated palladium surface coatings were measured by varying the palladium surface and by using uncoated inlet or exit surfaces. Variations in specimen thickness and in inlet hydrogen pressure demonstrated that the overall transport rate was not dependent on surface effects. Comparisons between gas phase charging experiments led to the tentative conclusion that differences in shapes of the permeation curves obtained by the two techniques are due to differences in hydrogen flux levels produced by the two different charging techniques. GRA

N79-32329# Army Materials and Mechanics Research Center, Watertown, Mass.
EXPERIMENTAL EVALUATION OF PEAK HEIGHT APPROXIMATION FOR X-RAY DIFFRACTED INTEGRATED INTENSITY METHOD Final Report
C. P. Gazzara Apr. 1979 17 p refs
(DA Proj. 1L1-61102-AH-42)
(AD-A070800; AMMRC-TR-79-22) Avail: NTIS HC A02/MF A01 CSCL 11/6

A method for characterizing an unresolved characteristic X-ray K sub alpha diffracted powder peak with respect to integrated intensity and Bragg angle has been tested. The method assumes the upper half of the diffracted peak to be Gaussian and the bottom half a Cauchy functional shape to match the experimentally measured diffraction peak. The peak height is used to compute the integrated intensity using calculated relationships. The integrated intensities of the Cuk sub alpha (111) and (200) X-ray diffracted peak doublets were measured from silicon powders employing variations in beam and receiving slit widths on commercial X-ray units and compared with the calculated intensities. This method offers promise as a fast and accurate technique as demonstrated by its ability to measure X-ray intensities to a precision of several percent under selective experimental conditions. GRA

N79-32330# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Metallurgy and Materials Science.
PHASE TRANSFORMATIONS IN Ti ALLOYS: A REVIEW OF RECENT DEVELOPMENTS
J. C. Williams Oct. 1978 26 p refs
(Contract N00014-76-C-0409)
(AD-A070906; JWTR-4) Avail: NTIS HC A03/MF A01 CSCL 11/6

The phase transformations in Ti alloys are reviewed. This review augments earlier reviews and emphasizes several transformations which have recently received attention. These include a thermal omega-phase formation, martensitic transformations, nucleation and growth decomposition of the beta-phase, the ordering reaction in hcp and bcc Ti alloys and the effects of processing history on microstructure. GRA

N79-32331# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.
FRACTURE TOUGHNESS OF WIDMANSTATTEN COLONIES OF AN ALPHA-BETA TITANIUM ALLOY
K. S. Chan and D. A. Koss Jun. 1979 30 p refs
(Contract N00014-76-C-0037)
(AD-A070745; TR-9) Avail: NTIS HC A03/MF A01 CSCL 11/6

The fracture toughness behavior of individual alpha plus Beta Widmanstatten colonies of the Ti-8Al-1Mo-1V alloy in the form of sheet has been investigated. Crack extension occurs predominantly across the Alpha-Beta lamellae under conditions of plane stress and on planes which are inclined both to the thickness and the width of specimens. Polycrystalline material has also been examined and is observed to exhibit fracture along a plane inclined through the thickness but not inclined across the width. Crack-tip plasticity in both types of material is dominated by through-thickness deformation involving slip and often twinning. In the single colony specimens, the crack-tip plasticity has been characterized experimentally by identifying the active slip/twinnning planes and by calculating the distribution of shear stresses on the possible deformation systems, using a maximum, macroscopic shear stress criteria. As suggested by the fracture behavior of the polycrystalline specimens, the macroscopic fracture plane across individual colonies is near that slip or twinning plane which experiences the largest shear stress when the macroscopic shear stress is a maximum. Author (GRA)

N79-32332# Textron Bell Aerospace Co., Buffalo, N. Y.
WELDABILITY OF FORMABLE SHEET TITANIUM ALLOY Ti-15V-3Cr-3Al-3Sn Final Report, 1 May 1977 - 31 Aug. 1978
A. E. Leach and J. D. McDonough Dec. 1978 85 p refs
(Contract F33615-75-C-5232)
(AD-A070747; AFML-TR-78-199) Avail: NTIS HC A05/MF A01 CSCL 11/6

Gas-Tungsten-Arc (GTA) and Electron Beam (EB) fusion welding process parameters were established for Ti-15V-3Cr-3Al-3Sn alloy sheet in 0.050-, 0.100- and 0.300-inch thicknesses. The material, purchased from Timet, was characterized by mechanical testing in the following conditions: solution annealed and solution annealed and aged at 900 and 950 F for eight hours. Solution annealed material is very ductile and formable. Aging response of base metal shows that 150 to 170 ksi minimum yield strengths can be achieved. GTA and EB welds were made using a square butt joint configuration in the 0.050- and 0.100-inch thickness. A 'V' joint configuration was used to weld 0.100-inch thick material wire using the GTA process. 0.300-inch material was welded with the EB process only. All weldments were made using production equipment and there were no anomalies in welding this material. X-ray and dye penetrant tests showed that weldments were crackfree and within porosity limits. Bend and tensile tests made on weldments in the as-welded condition were very ductile and compared favorably to the ductility of solution annealed base metal. Aging response of welded specimens, tensile tested in both longitudinal and transverse directions, was similar to base metal and properties compared favorably to base metal properties. Notched tensile strengths, fracture toughness, and crack growth rates all indicate that Ti-15V-3Cr-3Al-3Sn weldments are satisfactory for structural applications. GRA

N79-32333# Naval Ship Research and Development Center, Annapolis, Md. Ship Materials Engineering Dept.
GALVANIC CORROSION OF PIPING AND FITTING ALLOYS IN SULFIDE-MODIFIED SEAWATER
H. P. Hack May 1979 31 p refs
(SF5450059)
(AD-A070677; DTNSRDC/SME-79-31) Avail: NTIS HC A03/MF A01 CSCL 11/6

Two wrought piping alloys, 70-30 and 90-10 copper-nickel, were each galvanically coupled to each of four fitting alloys in sulfide-modified seawater for 30 days. The fitting alloys used were bronze (Composition M), cast Monel, wrought nickel-aluminum bronze, and cast 70-30 copper-nickel. The piping material/fitting material area ratio was 3:1, and the seawater velocity was 2.4 meters per second. Results indicated that the galvanic relationship between M-bronze or Monel and 70-30 copper-nickel is affected by sulfide additions in a manner that increases the corrosion of the fitting material, whereas similar couples with 90-10 copper-nickel show little effect of sulfide. GRA

N79-32334# Naval Civil Engineering Lab., Port Hueneme, Calif.
DEVELOPMENT OF SUPERCORRODING ALLOYS FOR USE

AS TIMED RELEASES FOR OCEAN ENGINEERING APPLICATIONS Final Report, Oct. 1977 - Sep. 1978
S. A. Black Mar. 1979 40 p refs
(ZF61512001)
(AD-A070860; CEL-TN-1550) Avail: NTIS HC A03/MF A01 CSCL 11/6

A family of supercorroding magnesium alloys that react spontaneously and vigorously with seawater has been developed at CEL. Supercorroding alloys are so named because of their high corrosion rate in seawater. Investigations of several different alloy formulations show that the alloys can be useful for generation of hydrogen for ocean buoyancy, fuel for thermodynamic engines and fuel cells, production of heat for divers and as self-destructing links for retrieval of oceanographic instruments. Supercorroding alloys with magnesium as the anode material and with several different cathode materials were fabricated and tested to determine mechanical and corrosive characteristics. Alloys with 5 atomic percent iron cathode produce 950 ml of hydrogen per gram of alloy and 13.3 K joules of heat per gram. One gram is over 90% reacted within one minute from immersion. Compacting and sintering produces samples with 9 ksi shear and tensile strengths. Corrosion rates for sintered samples are approximately .009 inches per hour. Alloys with other cathode materials and different levels of cathode content were fabricated and tested. Sufficient data is available on several different formulations of supercorroding alloys to permit preliminary selection for specific applications. GRA

N79-32335# General Electric Co., Lynn, Mass. Aircraft Engine Group.
CAST TITANIUM COMPRESSOR CASTING Final Report, Jul. 1976 - Dec. 1978
W. H. Ficht May 1979 137 p
(Contract DAAJ02-76-C-0057)
(AD-A071051; USARTL-TR-79-8) Avail: NTIS HC A07/MF A01 CSCL 11/6

The development of a process for centrifugally casting the Ti 6Al-4V compressor casing for the T700 turboshaft engine is described. The cast casing results in a 35-pound saving of material input and a 30-hour saving of shop labor (at the 250th unit) compared to the forging which it replaces, due to the cast net shape outer contour which includes features formerly welded to the forged casing. Conventional expendable wax patterns and ceramic shell molds were chosen over a permanent metallic mold system. Preheated molds were mounted vertically on a centrifuge and rotated at from 350 to 500 rpm during casting. Mechanical properties were well within design requirements although generally lower than forged properties. Ballistic testing showed the containment capability of the cast and forged material to be equal. Two cast casings were run in test engines and were judged to be equal in performance to forgings. There was no weight penalty associated with the use of a cast casing. GRA

N79-32336# Michigan Technological Univ., Houghton. Dept. of Mechanical Engineering.
MACHINING POWDER METALLURGY MATERIALS Final Report
C. H. Kahng Rock Island, Ill. Rock Island Arsenal Sep. 1978 84 p
(Contract DAAA09-74-C-2062)
(AD-A070913; SARRI-EN-TR-78-03) Avail: NTIS HC A05/MF A01 CSCL 11/6

Powder metallurgy (P/M) products eliminate the need for most machining; however, many P/M Components do require some machining and little is known about the machinability of these materials. Toward providing guidelines for machining P/M materials, machining tests were conducted on low and high density P/M steel (AISI 4640) specimens. Results of these tests are presented along with data on conventionally wrought AISI 4140 steel. The preference for low alloy steels in the manufacture of weapon components led to the choice of these materials for the investigation. Significant differences in cutting forces were experienced in the cutting of high and low density P/M materials. The maximum practical cutting speed in drilling was higher for low density P/M material than that for high density material. Tool wear in the reaming of P/M materials was negligible. In drilling, improvement of hole geometry by sequential machining operations varied greatly. Boring with a rigid bar gave the best geometry. Hardness of the material had decisive effects on machinability. Relatively burr-free holes could be drilled in P/M materials. Overall machinability of the investigated materials did not show significant differences. GRA

N79-32337# Rockwell International Science Center, Thousand Oaks, Calif.
NDE METHOD FOR CHARACTERIZING ANODIZED Al SURFACES Final Report, 1 Sep. 1977 - 32 Jun. 1978
T. Smith Wright-Patterson AFB, Ohio AFML Sep. 1978 113 p refs (Contract F33615-77-C-5215; AF Proj. 2418)
(AD-A070936; SC5123.23FTR; AFML-TR-78-146) Avail: NTIS HC A06/MF A01 CSCL 11/6

This report describes a study of the relationship between nondestructive inspection (NDI) for contaminants on phosphoric acid anodized (PAA) A1 7075-T6 and bond strength and degradation that results from the contamination. Contamination is used in the broad sense to include surface preparation process errors (e.g., incorrect anodize time or voltage) and handling damage, as well as organic contamination from humans and smog. It is demonstrated that the ellisometric technique can adequately reveal contamination at levels below and in the range that significantly degrades bond integrity. The ellisometric technique is not restricted to flat panels, as demonstrated by mapping a panel with 7 cm radius of curvature. However, mapping of curved surfaces would be facilitated by passing the sensor head over the panel rather than the panel under the head. This and mapping on NDI of smaller numbers of various shaped parts requires the development of a small miniaturized hand-held contamination tester. The design of such a tester is presented. GRA

N79-32338# Syracuse Univ., N. Y. Dept. of Chemical Engineering and Materials Science.
EXPLORATORY STUDY OF THE DYNAMIC FRACTURE DUCTILITY OF TRIP AND 300M STEELS Final Report
Volker Weiss, Albert Wu, and John Biegel Feb. 1979 76 p refs
(Contract DAAG46-77-C-0019)
(AD-A069909; AMMRC-TR-79-8) Avail: NTIS HC A05/MF A01 CSCL 11/6

The bulge characteristics of 300M steel and TRIP steel were studied at various strain rates and stress states. The 300M steel was heat treated to two conditions, isothermally transformed, and normalized. The TRIP steel was processed to four conditions by means of various amounts of warm working. The inherent directionality of TRIP steel required the development of a biaxial test for various strain rates other than the equibiaxial bulge test. The basic mechanical properties of the materials are given through their true stress-true strain curves. The equibiaxial bulge tests at three strain rates on the isothermally transformed 300M steel show that the fracture ductility increases with increasing strain rate. At low strain rate the fracture ductility of TRIP steel is a function of the stress state at fracture and of the amount of warm work during TRIP processing. For the two high strength TRIP steels (79% of warm work and 30% warm work), the plane strain fracture ductility decreases with increasing strain rate. A similar decrease of the plane strain fracture toughness with increasing strain rate is expected. Author

N79-32339# California Univ., Los Angeles. Dept. of Materials.
ACOUSTIC EMISSION BEHAVIOR OF A LOW ALLOY STEEL M.S. Thesis
Robert James Landy May 1979 114 p refs
(Contract N00014-75-C-0419)
(AD-A069965; TR-79-02) Avail: NTIS HC A06/MF A01 CSCL 11/6

Acoustic emission has become an important nondestructive evaluation technique, especially for pressure vessels. In the fabrication of heavy section pressure vessels, the materials experience various heat treatments which result in heterogeneous microstructures. Therefore, a program was undertaken to characterize the acoustic emission response to these variations in the microstructure of pressure vessel steel, namely, ASTM A533B steel. This data is intended to provide a base for evaluating

field testing results and simultaneously to enhance the understanding of acoustic emission sources in martensite and bainite during deformation and fracture. GRA

N79-32340# Sandia Labs., Albuquerque, N. Mex.
MICROSTRUCTURAL EVALUATION AND NON-DESTRUCTIVE EXAMINATION OF 2.25 Cr-1 Mo STEEL
J. A. VanDenavyle, W. B. Jones, and J. H. Gieske Jul. 1978 61 p refs
(Contract EY-76-C-04-0789)
(SAND-77-1557) Avail: NTIS HC A04/MF A01

Specimens of 2.25 Cr-1 Mo steel were damaged to various levels by creep and combined creep-fatigue cycling at 886 K (1100 F) with hold periods. Ultrasonic shear wave velocity measurements were performed and showed small changes with large amounts of creep or fatigue damage; these changes were deemed too small for practical application. Measurements of magnetic properties were unsuccessful in following damage. Optical and transmission electron microscopy (TEM) were performed on the samples. TEM observations showed that microstructural changes which occurred at 886 K (1100 F) did not occur homogeneously throughout the matrix; during creep, carbide spheroidization and coarsening began in widely separated regions, with an increasing fraction of the material undergoing the process with time. A precipitate was observed to form during fatigue which did not occur during simple aging or creep. DOE

N79-32341# Sandia Labs., Albuquerque, N. Mex.
IMPLANTATION METALLURGY
F. L. Vook 1978 23 p refs Presented at NRC Solid State Sci. Comm. and Panel Meeting, Oak Ridge, Tenn., 1 Jun. 1978
(Contract EY-76-C-04-0789)
(SAND-78-1089C; Conf-780655-1) Avail: NTIS HC A02/MF A01

The rapid production of specially tailored equilibrium phases for metallurgical research and development is described. The intimate atomic mixtures with controlled compositions that are prepared by ion implantation permit the rapid low temperature formation of desired phases which can be characterized by electron microscopy and diffraction. Interfacial effects are avoided and the use of ion backscattering to continually and nondestructively monitor the depth distribution of the implanted atom concentration to depths beyond the implanted layer permits sensitive determinations of solubilities, diffusion rates and phase diagrams of equilibrium phases of intermetallic alloys. DOE

N79-32342# Sandia Labs., Albuquerque, N. Mex.
OBSERVATIONS OF THE VACUUM ARC AND METAL TRANSFER DURING VACUUM CONSUMABLE ARC REMELTING
F. J. Zanner 1979 11 p refs Presented at Intern. Conf. on Metallurgical Coatings, San Diego, Calif., 23 Apr. 1979
(Contract DE-AC04-76-DP00789)
(SAND-79-0922C; Conf-790442-8) Avail: NTIS HC A02/MF A01

High speed color photography was used to record the vacuum arc and electrode surfaces during vacuum consumable arc remelting of a maraging steel alloy. Events on the film were coordinated with electrical signals from the vacuum arc. A previous conclusion from electrical observations that metal transfer occurs when liquid metal spikes hanging from the cathode form a low resistance bridge (drop short) by touching the anode and then subsequently rupture, was visually verified with the exception that actual column rupture occurs after arc re-ignition and not at the instant of re-ignition. Observations also show that cathode spot accumulation (attack) plays an important role in impeding metal transfer and that transfer occurs primarily by a bulk type process. Thus, inclusions and any solid particles are transferred with the bulk. DOE

N79-32343# Helsinki Univ. of Technology, Espoo (Finland). Inst. fuer Prozessmetallurgie.
THE EFFECT OF A MAGNESIUM OXIDE ADDITIVE ON THE REDUCTION OF IRON OXIDES Ph.D. Thesis [UEBER DEN EINFLUSS VON MAGNESIUMOXYD-ZUSATZ AUF DIE REDUCTION DES WUESTITS]
Jouko Haerkki 1978 72 p refs In GERMAN Sponsored by Ges. Outokumpu Oy and Tech. fuer Wirtsch. Beihilfe
(TKK-V-A3(1978); ISBN-951-751-299-6) Avail: NTIS HC A04/MF A01

The reduction of iron oxide to metallic iron in blast furnaces, or by direct reduction was studied using hydrogen. Magnesium oxide additives diminish the reduction rate constant when the iron oxide is highly nonstochiometric, but increases it when the nonstochiometry is low. Optical and scanning electron microscopy were used to study material characteristics and structures. Theoretical considerations are discussed. Author (ESA)

N79-32344# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
ALUMINUM ALLOYS FOR ADVANCED STRUCTURAL APPLICATIONS IN TRANSPORT AIRCRAFT
R. J. H. Wanhill Feb. 1979 33 p refs Submitted for publication
(NLR-MP-77023-U) Avail: NTIS HC A03/MF A01

Three topics of interest for aluminum alloy aircraft structural materials are discussed. These are the advent of metallurgically cleaner alloys like 2124, 2048 and 7475, possessing higher fracture toughness than older materials, e.g. 2024 and 7075, the potential application of 7000 series alloys (notably 7475) in tension panels, rather than the customary 2000 series alloys, and the development of alloys like 7049, 7050 and 7010, combining high strength through thick sections with high fracture toughness and good resistance to stress corrosion and exfoliation. Two developments which may reach commercial production status in the future are also considered. These are powder metallurgy alloys for extrusions and forgings with improved stress corrosion resistance, fracture toughness, and fatigue strengths as compared to conventional materials, and thermomechanical treatment to achieve combinations of properties unobtainable from conventional processing. Author (ESA)

N79-32345# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
THE EFFECT OF SHEET THICKNESS ON FLIGHT SIMULATION FATIGUE CRACK PROPAGATION IN 2024-T3, 7475-T761, AND MILL ANNEALED Ti-6Al-4V
R. J. H. Wanhill Feb. 1979 22 p refs Sponsored in part by Netherlands Agency for Aerospace Programmes (NIVR)
(NLR-MP-77024-U) Avail: NTIS HC A02/MF A01

Flight simulation fatigue crack propagation tests were carried out on 2024-T3, 7475-T761, and mill annealed Ti-6Al-4V sheet in thicknesses up to 3 mm. The specimens are representative of transport aircraft lower wing skin stiffened panels with end load capacities of 1.5 and 3 MN/m. Results prove that sheet thickness has a significant effect on crack propagation. Thinner gage materials exhibited slower crack propagation mainly because of greater retardation of crack growth after severe flights. The relevance of the results for the choice of advanced structural concepts and materials is discussed and a recommendation for further investigation is given. Author (ESA)

N79-32346# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
QUANTITATIVE MODELS OF HYDROGEN INDUCED CRACKING IN HIGH STRENGTH STEEL
H. P. vanLeeuwen 5 Jun. 1978 103 p refs Submitted for publication
(NLR-MP-78018-U) Avail: NTIS HC A06/MF A01

Hydrogen embrittlement models are summarized. The pressure model, the adsorption model, the decohesion model, and the dislocation transport model, potentially applicable to high strength steel, are discussed in more detail. Analyses concerning the effect of stress on hydrogen solubility, embrittlement by adsorbed hydrogen, crack propagation in a gaseous hydrogen environment, crack propagation due to internal hydrogen embrittlement, and microcracking at the decohesion enclave are summarized. The prediction of the threshold stress intensity for external hydrogen embrittlement cracking on account of lattice decohesion as well as hydrogen diffusion in the near crack tip stress field and hydrogen transport by moving dislocations are also reviewed. The pros and cons of the various crack initiation models along with their limits in materials screening applications are discussed in an extended summary of conclusions. Author (ESA)

N79-32347# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
QUANTITATIVE MODELS OF HYDROGEN EMBRITTLEMENT IN HIGH STRENGTH STEEL
H. P. vanLeeuwen Jun. 1979 85 p refs Presented at Seminar, Ontario, Sep. 1978
(NLR-MP-78024-U) Avail: NTIS HC A05/MF A01

Hydrogen embrittlement models are summarized. The pressure model, the adsorption model, the decohesion model, and the dislocation transport model, potentially applicable to high strength steel, are discussed in more detail. Various analyses concerning the stress effect on solubility, crack initiation and propagation in material exposed to external hydrogen, hydrogen diffusion in the near crack tip stress field, crack propagation in material containing dissolved hydrogen, and initiation of embedded microcracks promoted by dissolved hydrogen are reviewed. The limits of these quantitative models in materials screening applications and the demonstrated effect of hydrogen embrittlement on crack initiation are discussed in an extended summary of conclusions. Author (ESA)

N79-32348# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
FATIGUE TESTING OF TITANIUM 6AI4V
Nils Larsson Jan. 1979 27 p
(Contract FMV-F-K-82223-76-001-21-001)
(FFA-TN-HU-1993) Avail: NTIS HC A03/MF A01

Fatigue tests on titanium 6 Al4V were performed using 90 specimens from 6464-2 and 6464-5 standard materials in order to verify preliminary Haig diagrams based on foreign investigations. Turned plain and notched specimens from bar stock were tested. Three different fatigue cases with R=-1, R=0, and sigma minimum-250 N/mm sq were applied. Static rupture tests were also performed. Results show no decisive difference between 6464-2 and 6464-5 materials in the static tests, while for the fatigue tests a comparatively large scatter of results is found for the 6464-5. Author (ESA)

N79-32349# National Physical Lab., Teddington (England). Div. of Chemical Standards.
TORSION TESTS ON STEELS USED IN THE MANUFACTURE OF HIGH PRESSURE VESSELS
G. ONeill and W. F. Wall Mar. 1979 17 p refs
(NPL-Chem-97) Avail: NTIS HC A02/MF A01

Design criteria for thick-walled cylinders in a 45 kilobar gaseous environment apparatus were based on the shear properties of H-13 steel. The data required was obtained from torsion tests on specimens of tempered H-13 bar stock followed by final tests on samples from the actual cylinder forgings. It was felt that shear data on some other steels commonly used for high pressure vessel construction would be of value to design engineers and the results for EN24, EN25, 3.5 percent NCMV, and three maraging steels, in addition to the data on H-13 are presented. The test apparatus is briefly described and the data analysis, which is supported by stress-strain curves for the various materials examined, is discussed. Author (ESA)

N79-32350# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.
EFFECT OF AN ANTI-CORROSION PENETRANT ON THE FATIGUE LIFE OF VARIOUS RIVETED JOINTS DURING FLIGHT SIMULATION TESTS
J. Schijve, F. A. Jacobs, and P. J. Tromp 15 Jan. 1979 33 p refs
(Contract NIVR-1725)
(NLR-TR-77103-U) Avail: NTIS HC A03/MF A01

Comparative flight simulation tests on four types of joints of 2024-T3 sheet material were carried out with and without application of the penetrant LPS-3. Types of joints tested were double strap joints with hi-lok bolts, asymmetric strap joints, lap joints with countersunk rivets, and lap joints with dimpled holes. Observations on slip during the fatigue tests as well as during static tests to failure were made. A reduction in fatigue life was observed in asymmetric strap joints and simple lap joints, but no reduction was found for the other types of joints tested. The effect depends on the design of the joint, while the maximum load during the test may also be significant in view of the occurrence of slip. Author (ESA)

N79-32351# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.
HEAT TREATMENT STUDIES OF ALUMINUM ALLOY TYPE 7050 FORGINGS. CORRODED-SPECIMEN FATIGUE TESTS AND SSC PROPAGATION TESTS
L. Schra and H. P. vanLeeuwen 15 Jan. 1979 43 p refs
(Contract NIVR-1743)
(NLR-TR-77124-U) Avail: NTIS HC A03/MF A01

The influence of previous corrosion on fatigue life was investigated. It was found that a slight corrosive attack could drastically reduce fatigue life. The damaging effect of corrosion was greater for the alloy AA 7050 than for AZ 74.61. It was established that fatigue cracks initiated from various corrosion pits in these materials. A second series of stress corrosion crack propagation tests on AA7050 was performed. Quenching in boiling water was found to lead to high crack growth rates and a low threshold stress intensity value K sub ISCC in spite of the low yield stress obtained. Other heat treatment led to a monotonic increase in K sub ISCC with decreasing strength. Author (ESA)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N79-32352 Lehigh Univ., Bethlehem, Pa.
COLUMN CHROMATOGRAPHY OF POLYMER LATEXES Ph.D. Thesis
Dennis Joseph Nagy 1979 251 p
Avail: Univ. Microfilms Order No. 7919980

The chromatographic separation of polymer latexes is discussed. A parallel capillary, flow-through model for particle separation is presented to account for the ionic strength behavior of the separation factor in a large pore, porous system. The mathematical model for the separation is based on calculations for the convected Brownian motion of colloidal particles in sized capillary tubes in the presence of a potential gradient. The results obtained from the model compare favorably to the experimental data for the porous systems, taking into account total ionic strength effects due to both added salt and emulsifier. Computations are also presented to show the role of various material parameters for the prediction of enhanced rate of particle transport as well as the optimization of column characteristics such as pore size and porous volume fraction. Dissert. Abstr.

N79-32353 Massachusetts Univ., Amherst.
A RHEO-OPTICAL STUDY OF THE STRESS-INDUCED CRYSTALLIZATION OF POLY(ETHYLENE TEREPHTHALATE) Ph.D. Thesis
Margaret Kaye Parpart 1979 226 p
Avail: Univ. Microfilms Order No. 7920883

The stress-induced crystallization of polyethylene terephthalate was studied using simultaneous measurements of birefringence and stress during and after the deformation of thin films. Measurements were made at various strain rates and elongations at temperatures above the glass transition but below where noticeable isothermal crystallization occurs, insuring that all crystallinity observed was stress-induced. Crystallinty changes may be calculated from the simultaneous observations of stress and birefringence during the course of the crystallization. The stress-induced crystallization is affected by the elongation, strain rate, and temperature, as is the rate of crystallization and the superstructure obtained. Dissert. Abstr.

N79-32354 Akron Univ., Ohio.
EPIMERIZATION OF ISOTACTIC POLYSTYRENE Ph.D. Thesis
Lloyd Shepherd 1979 128 p
Avail: Univ. Microfilms Order No. 7919415

Epimerization was conducted by heating solutions of isotactic polystyrene in hexamethyl phosphoramide which contained potassium t-butoxide. Stereochemical equilibrium was attained after fourteen hours reactions at 100 deg. The 300-MHz methine proton resonance patterns of partially epimerized isotactic polystyrene and of free radical initiated polystyrene have been

analyzed. The latter polymer is essentially atactic and has the same pmr spectrum as completely epimerized polystyrene. Conventional polystyrene therefore seems to be at stereochemical equilibrium. Isotactic polystyrene polymers were analyzed using 300-MHz pmr spectroscopy. Dissert. Abstr.

N79-32355 Akron Univ., Ohio.
STRUCTURE-PROPERTY RELATIONS OF ELASTOMERIC ABA TRIBLOCK COPOLYMERS Ph.D. Thesis
Mun-Fu Tse 1979 167 p
Avail: Univ. Microfilms Order No. 7920443

Experimental work was carried out on these elastomers in an attempt to demonstrate the-relation between their rheological behavior and tensile strength, on the one hand, and such parameters as the glass transition temperature of the end blocks, chain entanglements of the center blocks, incompatibility of the A and B blocks and interfacial energy between domains and matrix. Experimental measurements included tensile properties, dilation under strain, and both compressive creep and capillary flow. Strain dilation was found to depend greatly on the calculated work of adhesion between the two phases, and can probably account for the low strength of the siloxane based polymers compared to their diene counterpart. The incompatibility of the two phases plays a role not only in the phase separation, but also strongly affects the flow properties, in certain ranges of shear rate. Dissert. Abstr.

N79-32356 State Univ. of New York Coll. of Environmental Science and Forestry, Syracuse.
BINDING OF ANIONIC DYES TO CATION-SPECIFIC POLY (CROWN ETHERS) Ph.D. Thesis
Lok-hei Wong 1979 135 p
Avail: Univ. Microfilms Order No. 7920323

The binding of Na(+), K(+) and Cs(+) to poly (vinyl benzo-18-crown-6) (P18C6) in water was determined potentiometrically and compared with their binding to the monomeric analog 4' -methyl benzo-18-crown-6 (MB18C6). The K(+) binding to P18C6 differs little from that found for MB18C6, but due to more stringent dehydration requirements, binding of Na(+) to P18C6 is weaker than to MB18C6. The Cs(+) is more effective to P18C6 than MB18C6 as a result of the formation of sandwich type 2:1 crown-cation complexes. The K(+) binding to P18C6 as well as the binding of picrate anions to this polymer were determined as a function of the electrostatic potential. The cation effect on picrate binding was utilized to determine spectrophotometrically the order of binding of a series of cations to P18C6, and the results were confirmed by using another dye which produces much larger optical shifts on binding to P18C6 than does the picrate anion. Dissert. Abstr.

N79-32357 Princeton Univ., N. J.
FORMATION AND PROPERTIES OF RUBBER-MODIFIED EPOXIES Ph.D. Thesis
Louis T. Manzione 1979 257 p
Avail: Univ. Microfilms Order No. 7919775

A study is presented of the formation, morphology, and mechanical properties of rubber-modified epoxies. Low levels of a carboxyl-terminated acrylonitrile-butadiene copolymer added to epoxy resin improved toughness and impact properties. A rubber-rich second phase forms in-situ with rubber domains 0.1 to 5.0 microns in diameter. These domains provide improvement by introducing several additional energy dissipation mechanisms. The control of the development of morphology, the characterization of the mechanical properties of the morphologies developed, and the mechanisms that produced these properties were emphasized. Dissert. Abstr.

N79-32358*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF 25 CYCLES OF LAUNCH PAD EXPOSURE AND SIMULATED MISSION HEATING ON SPACE SHUTTLE REUSABLE SURFACE INSULATION COATED WITH REACTION CURED GLASS
Philip O. Ransone, J. D. Morrison (NASA. Kennedy Space Center), and John E. Minster (NASA. Kennedy Space Center) Sep. 1979 21 p refs
(NASA-TM-80160) Avail: NTIS HC A02/MF A01 CSCL 11B

Tiles of space shuttle reusable surface insulation coated with reaction cured glass were subjected to 25 cycles of launch pad exposure and simulated mission heating. The coating could not withstand the environment without cracking. Water absorption after cracking reached as high as 150 weight percent. Exposure of insulation fibers beneath the coating to contaminants dissolved in absorbed water initiated fiber degradation. F.O.S.

N79-32359*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION AND AUGER ANALYSIS OF A ZINC-DIALKYL-DITHIOPHOSPHATE ANTIWEAR ADDITIVE IN SEVERAL DIESTER LUBRICANTS
William A. Brainard and John Ferrante Washington Oct. 1979 16 p refs
(NASA-TP-1544; E-9944) Avail: NTIS HC A02/MF A01 CSCL 11H

The wear of pure iron in sliding contact with hardened M-2 tool steel was measured for a series of synthetic diester fluids, both with and without a zinc dialkyl dithiophosphate (ZDP) antiwear additive, as test lubricants. Selected wear scars were analyzed by an Auger emission spectroscopy (AES) depth profiling technique in order to assess the surface film elemental composition. The ZDP was an effective antiwear additive for all the diesters except dibutyl oxalate and dibutyl sebacate. The high wear measured for the additive-containing oxalate was related to corrosion; the higher wear measured for the additive-containing sebacate was due to an oxygen interaction. The AES of dibutyl sebacate surfaces run in dry air and in dry nitrogen showed large differences only in the amount of oxygen present. The AES of worn surfaces where the additive was effective showed no zinc, only a little phosphorus, and large amounts of sulfur.
Author

N79-32360# Princeton Univ., N. J. Dept. of Physics.
OPTICAL VERSUS TRANSPORT PROCESSES IN CHALCOGENIDE GLASSES
D. C. Licciardello and D. L. Stein 28 Jun. 1979 12 p refs
(Contract N00014-77-C-0711; Grant NSF DMR-78-03015)
(AD-A070927) Avail: NTIS HC A02/MF A01 CSCL 20/12

A model for amorphous chalcogenide semiconductors predicts an intrinsic photoinduced paramagnetic band of metastable states which may absorb light and give rise to an electron spin resonance. It is shown that these centers are unrelated to those responsible for limiting carrier mobility in accord with recent experiments on doped a - As2Se3. GRA

N79-32361# National Bureau of Standards, Washington, D. C. Polymer Science and Standards Div.
PLASMA POLING OF POLY(VINYLIDENE FLUORIDE): PIEZO AND PYROELECTRIC RESPONSE
J. E. McKinney, G. T. Davis, and M. G. Broadhurst Jun. 1979 31 p refs
(Contract N00014-79-C-0012)
(AD-A070750; TR-11) Avail: NTIS HC A03/MF A01 CSCL 20/3

A plasma poling technique and its use with polyvinylidene fluoride (PVDF) films is described. Specimens of biaxially drawn (blow extruded) PVDF containing both Form I (Beta) and Form II (alpha) crystals were poled under various conditions in a plasma field while the charging current was monitored to determine the polarization. Subsequently, both piezo- and pyroelectric activity were measured in order to evaluate their magnitudes with respect to the remnant polarization (that is, the polarization remaining after returning the applied field to zero). The results are shown to be in reasonable quantitative agreement with the predictions of a model of PVDF consisting of a mixture of preferentially aligned crystals in randomized amorphous material. GRA

N79-32362# National Bureau of Standards, Washington, D. C. Polymer Science Standards Div.
FERROELECTRIC POLARIZATION IN POLYMERS
M. G. Broadhurst and G. Thomas Davis Jun. 1979 19 p refs
(Contract N00014-79-C-0012)
(AD-A070768; TR-13) Avail: NTIS HC A02/MF A01 CSCL 20/3

A cooperative model has been developed to describe ferroelectric polarization in polyvinylidene fluoride (PVDF). The

molecular dipoles within the crystal are assumed to have two or more orientations available to them and the lattice energy of a given orientational site is assumed to be proportional to the fraction of molecules having that orientation. An analytical solution is given for the 2-site model which predicts polarization hysteresis typical of ferroelectrics. However, a more complex 6-site model, which can be analyzed numerically, is needed to account for observed infrared hysteresis data and electric-field-induced X-ray structural changes which have been reported for PVDF. Although the model is simple, rather complex behavior is observed including a gradual increase or decrease in the remnant polarization with number of cycles of electric field application. Though the agreements with various experimental data are good an obvious need to include kinetic effects in the model is indicated.

Author (GRA)

N79-32363# FRL - An Albany International Co., Dedham, Mass.
KEVLAR PROPERTIES INVESTIGATION DEVELOPMENT OF KEVLAR TENSILE TEST METHODS Interim Report, 13 Feb. 1978 - 31 Jan. 1979
Stephen L. Goodwin and Norman J. Abbott Wright-Patterson AFB, Ohio AFFDL Mar. 1979 69 p refs
(Contract F33615-78-C-3406; AF Proj. 2402)
(AD-A071405; FFDL-TR-79-3019) Avail: NTIS HC A04/MF A01 CSCL 11/5

Testing procedures which are used for nylon parachute materials have not been satisfactory for testing their Kevlar counterparts. Kevlar's high strength and low elongation can result in premature breaks and, thus, inordinately low values of breaking strength. In an effort to understand the causes of these spuriously induced failures, a study was designed to investigate the reasons for premature breaks. Extensive tensile testing with a wide variety of Kevlar parachute component materials has led to the adoption of new jaws and testing techniques designed to give breaks in the free length with nearly simultaneous failure of all warp yarns, high values of breaking strength and low variability. The new jaws are described and their use illustrated for a range of typical parachute component materials. A set of design drawings for the optimized jaws is included, and a proposed text which describes the procedure to be used in tensile testing Kevlar narrow fabrics has been drafted for inclusion in Military Specifications. Author (GRA)

N79-32364# SRI International Corp., Arlington, Va.
NUCLEATION AND GROWTH OF CRACKS IN CVD ZnS UNDER PARTICLE IMPACT, PART 2 Annual Report
D. A. Shockey, K. C. Dao, and D. R. Curran Apr. 1979 55 p refs
(Contract N00014-76-C-0657; SRI Proj. PYU-4928)
(AD-A069528) Avail: NTIS HC A04/MF A01 CSCL 07/2

This research program was undertaken to identify and evaluate material properties governing fracture damage development in a laser window material under hard particle impact. The approach was to determine the sequential development of fracture damage in a ceramic in the vicinity of a particle impact site, to quantitatively assess the population of radial cracks, and to deduce crack nucleation and growth expressions and properties by correlating the damage with an appropriate load parameter. Individual 800-micrometers-diameter tungsten carbide (WC) spheres were accelerated in a pneumatic gun to velocities up to 80 m/s and made to impact polished surfaces of chemical-vapor-deposited zinc sulfide (CVD ZnS) to produce various levels of impact damage in the form of a plastic impression and a population of cracks. The size distributions of radial cracks were determined as a function of plastic impression radius (see Figure 7). The shapes of the crack size distribution curves suggest that the size distribution of inherent flaws is exponential, consistent with the results of probability theory. These curves further suggest that the growth law for radical cracks is similar in form to expressions derived from elastic energy balances. GRA

N79-32365# Pittsburgh Univ., Pa. Dept. of Mechanical Engineering.
MOLECULAR STRUCTURE AND COHESIVE PROPERTIES OF POLYMERIC ADHESIVES Final Report, 15 Apr. 1976 - 15 Apr. 1978
Michael J. Doyle Nov. 1978 168 p refs
(Contract F33615-76-C-5108; AF Proj. 2303)
(AD-A069517; AFML-TR-78-117) Avail: NTIS HC A08/MF A01 CSCL 11/9

The objective of the program was to develop quantitative relationships between molecular structure and cohesive strength properties of modified epoxy adhesives. Two commercial adhesives, a nylon-epoxy resin and a rubber-epoxy resin, were characterized and quantitatively analyzed. Model compositions were prepared in the laboratory equivalent to these two commercial materials. The rheological behavior as a function of curing conditions was characterized by torsional braid analysis. Results showed that at fixed composition the glass transition of the epoxy varied from 110 C to 140 C depending on cure history. The compatibility of the main components of the rubber modified the model adhesive versus composition and temperature was determined by cloud point measurements. The observed morphology of cured CTBN modified epoxy resins was consistent with the miscibility diagram. GRA

N79-32366# Sandia Labs., Albuquerque, N. Mex.
FOURIER TRANSFORM INFRARED ANALYSIS OF PLASMA POLYMERIZED 2-VINYLPYRIDINE THIN FILMS
K. W. Bieg and D. K. Ottesen 1978 11 p refs Presented at American Chemical Society Meeting, Miami, Fla., 10 Sep. 1978
(Contract EY-76-C-04-0789)
(SAND-78-0761C; Conf-780902-9) Avail: NTIS HC A02/MF A01

As a preliminary step toward the study of electrical and aging properties thin-film capacitors made from plasma polymerized 2-vinylpyridine thin films, the chemical structure of these films deposited under a variety of plasma reactor conditions was investigated. Fourier transform infrared spectroscopy was found to be a useful technique for the characterization of plasma polymerized organic thin films (1,000 to 40,000 A) deposited on aluminum substrates. Further, this technique was used to observe variations in the chemical structure of poly (2-vinylpyridine) films as a function of reactor conditions (pressure, power, and carrier gas). DOE

N79-32367# Brookhaven National Lab., Upton, N. Y.
PERFORMANCE OF CERAMIC MATERIALS IN HIGH TEMPERATURE STEAM AND HYDROGEN
F. L. Horn, J. A. Fillo, and J. R. Powell 1979 5 p refs Presented at Fusion Reactor Mater. Meeting, Miami Beach, Fla., 29-31 Jan. 1979
(Contract EY-76-C-02-0016)
(BNL-25812; Conf-790125-56) Avail: NTIS HC A02/MF A01

Materials considered for use in fusion blankets for synthetic fuel production were exposed to flowing steam and a combination of steam and hydrogen at temperatures up to 1668 K and flow velocities of 10 meters per second, which are characteristic of proposed blanket conditions. The penetration rate of 2 mm per year for silicon carbide in steam at 1400 K increased to 6 mm per year at 1600 K, while rates for alumina, zirconia, and magnesia were below 0.1 mm per year. Steam containing 32 to 44 volume percent hydrogen caused a large increase in the erosion rate of aluminia, zirconia, and magnesia at elevated temperatures. The temperature above which the erosion rate greatly increased was 1400 K for magnesia, 1550 K for alumina, and 1600 K for zirconia. DOE

N79-32238*# Ford Aerospace and Communications Corp., Palo Alto, Calif.
LUNAR BUILDING MATERIALS: SOME CONSIDERATIONS ON THE USE OF INORGANIC POLYMERS
Stuart M. Lee *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 233-241 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 07D

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N79-32368 Texas Univ. at Austin.
A STUDY OF HOMOGENEOUS REDUCTION OF CARBON MONOXIDE TO HYDROCARBONS AND METHANOL Ph.D. Thesis
Yao-Ching Liu 1979 127 p
Avail: Univ. Microfilms Order No. 7920158

The Fischer-Tropsch reaction, in which carbon monoxide and hydrogen react to give hydrocarbons over heterogeneous catalysts, was studied under homogeneous conditions and a new approach to the synthesis of methanol from CO and H2O was investigated. No hydrocarbons were detected when CO and H2 were reacted in the presence of transition metal carbonyls [Fe(CO)5, Mn2 (CO) 10], however, a homogeneous synthesis of hydrocarbons was obtained when a Lewis acid (BF3) was introduced under similar conditions. The yield of hydrocarbons was small (one percent based on metal). Methanol and KCr2H(CO)10 were found when Cr(CO)6 was treated with KOH in aqueous THF at 80 C and a mechanism for this reaction was proposed. Treatment of KCr2H(CO)10 with carbonic acid followed by reduction with LiBH4 gave methanol in 18 percent yield. Dissert. Abstr.

N79-32369*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EXPERIENCE WITH FLUORINE AND ITS SAFE USE AS A PROPELLANT
D. L. Bond, M. E. Guenther, L. D. Stimpson, L. R. Toth, and D. L. Young 30 Jun. 1979 91 p refs
(Contract NAS7-100)
(NASA-CR-162296; JPL-Pub-79-64) Avail: NTIS HC A05/MF A01 CSCL 21I

The industrial and the propulsion experience with fluorine and its derivatives is surveyed. The hazardous qualities of fluorine and safe handling procedures for the substance are emphasized. Procedures which fulfill the safety requirements during ground operations for handling fluorinated propulsion systems are discussed. Procedures to be implemented for use onboard the Space Transportation System are included. J.M.S.

N79-32370# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
AN APPLICATION OF THE THEORY OF MATERIALS WITH VARIABLE BONDING TO SOLID PROPELLANT Final Technical Report, 9 Nov. 1976 - 15 Apr. 1979
Michael H. Quinlan Jun. 1979 35 p refs
(AD-A070188; AFRPL-TR-78-37) Avail: NTIS HC A03/MF A01 CSCL 21/9

The development of a constitutive theory for materials with variable bonding materials which respond to applied deformations by rupture of particle-to-particle bonds is described. The theory is applied to materials in which bond breakage can be represented as a rate process. The result is a constitutive law which represents the stress response to an applied strain as the sum of a linear viscoelastic stress component and a stress component due to bonding bond breakage. The bonding stress component is linearly related to the bonding rate; the bonding state is governed by a nonlinear ordinary differential equation. The constitutive law was applied to data from tests on TP-H1011 propellant. The tests utilized cyclic loading of the propellant to provide a mixture of damaged and undamaged propellant responses.
Author (GRA)

N79-32371# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
DEFLAGRATION TO DETONATION TRANSITION BEHAVIOR OF ALUMINIZED HMX
Donna Price and A. R. Clairmont, Jr. 4 Jun. 1979 45 p refs
(AD-A070645; NSWC/WOL/TR-79-119) Avail: NTIS HC A03/MF A01 CSCL 19/1

The effect of fine (5 microns) and coarse (95 microns) Al on the deflagration-to-detonation (DDT) behavior of HMX, in charges pressed to 90% theoretical maximum density (TMD), was studied. It was found that Al slows down the DDT process increasingly as the content of Al increases; that is, it increases predetonation column length and the relative times to detonation. Fine Al is more effective than coarse in delaying DDT, at a given content, but both are inferior to wax in this respect. GRA

N79-32372# Department of Energy, Washington, D. C. Information Administration.
ROLE OF REFINED PRODUCT IMPORTS IN THE DOMESTIC FUEL MARKET
M. J. Frederiksen Apr. 1979 64 p refs
(DOE/EIA-0102/53) Avail: NTIS HC A04/MF A01

The effects of domestic petroleum regulations on refined product prices in the United States and on the tradeoff between the levels of domestic refinery production and refined product imports were analyzed: (1) the crude oil cost advantage which domestic refiners enjoy because of crude oil price controls decreased by 50 percent since March 1976; (2) at least some of the resulting increase in crude oil acquisition cost was passed through into gasoline and distillate prices; (3) in the East Coast residual fuel oil market, imports have increased substantially since 1976, and the increase may have prevented the passthrough of crude oil cost increases; (4) the crude oil cost advantage and the small refiner bias in the entitlements program have caused greater domestic refinery production and lower utilization of foreign refining capacity than would have occurred without the regulations; and (5) deregulation of crude oil prices is likely to result in some increase in refined product prices. DOE

N79-32373# Sandia Labs., Albuquerque, N. Mex.
FUELS FROM MAGMA: A POTENTIAL ENERGY SOURCE
T. M. Gerlach 1978 8 p refs Presented at the 2d Circum-Pacific Energy and Mineral Resources Conf., Honolulu, 30 Jul. 1978
(Contract EY-76-C-04-0789)
(SAND-78-0191; Conf-780737-1) Avail: NTIS HC A02/MF A01

The chemical and thermodynamic basis, the confirmatory laboratory experiments, and the geological data that point to the potential of magma as a resource that could produce large amounts of hydrogen as well as carbon monoxide and methane are discussed. The method of fuel production proposed depends on the reducing action of basalt on injected water; this chemical interaction causes the oxidation of ferrous components in the basalt and the production of hydrogen. The amount of hydrogen produced by a given body of basalt can be enhanced by introducing natural organic matter (biomass) into the injected water. This also would permit the method to be used to produce appreciable quantities of carbon monoxide and methane, and allows the exploitation of less FeO-rich magmas and hot rocks. Calculations show that the thermal energy of the magma may be used to gasify the biomass with resultant gas species resembling those from more conventional coal gasification processes. DOE

N79-32374# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
REVIEW OF CURRENT RESEARCH ON HYDROCARBON PRODUCTION BY PLANTS
H. M. Benedict and B. Inman Jan. 1979 38 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-33-129) Avail: NTIS HC A03/MF A01

Except in the case of guayule (Parthenium argentatum Gray), research on hydrocarbon species generally has not advanced beyond preliminary screening, extraction, and growth studies. Virtually no field studies have been initiated; hydrocarbon component extraction, separation, identification, and characterization have been only timidly approached; the biochemistry of hydrocarbon formation remains virtually untouched; and potential market analysis has been based on insufficient data. Due to the infant state of technology in this area of energy research, it is not possible to predict or satisfactorily assess at this time the potential contribution that plant hydrocarbons might make toward decreasing the nation's dependence upon petroleum. However, the general impression received from experts interviewed during this review was that the major thrust of research should be directed toward the manufacture of petrochemical substitutes rather than fuel production. DOE

N79-32375# Department of Energy, Laramie, Wyo. Energy Technology Center.

MATHEMATICAL MODEL OF FORWARD COMBUSTION RETORTING OF OIL SHALE

L. Dockter and H. G. Harris Jul. 1978 24 p refs

(Contract EX-76-S-01-2234)

(LETC/TPR-78/1) Avail: NTIS HC A02/MF A01

The first version or base model is described of a mathematical model of vertical, forward combustion retorting of oil shale that was developed through 1974 at the Laramie Energy Technology Center in Laramie, Wyoming. The model was written to simulate conditions and processes occurring in LETC's experimental batch-type 150-ton retort. Information presented deals with the reasoning and justification for developing the model, a description of the modeling effort, and a comparison of the yields, retorting rates, and other information obtained from the model as compared with actual results from the 150-ton retort. Good qualitative agreement between the base model and actual experimental results is found. However, quantitative agreement is not realized in this version of the model; some reasons for this are discussed. DOE

N79-32376# California Univ., Livermore. Lawrence Livermore Lab.

LOW DETONATION VELOCITY: HIGH ENERGY EXPLOSIVES

J. W. Kury and H. C. Hornig 1978 13 p Presented at Symp. on High Pressures, Paris, 22 Aug. 1978

(Contract W-7405-eng-48)

(UCRL-80458; Conf-780813-11) Avail: NTIS HC A02/MF A01

A high energy explosive with an unusually low detonation velocity was formulated for metal acceleration applications. This plastic-bonded explosive contains HMX, potassium perchlorate, aluminum and estane. Its energy is comparable to octol, yet its detonation velocity is only 7.4 mm/micron sec. This appears to be near the minimum detonation velocity that one can attain and still maintain a metal accelerating ability equivalent to octol. DOE

N79-32377# Los Alamos Scientific Lab., N. Mex.

DEVELOPMENT OF A LARGE ELECTRICALLY DRIVEN FLYER SYSTEM FOR EXPLOSIVE INITIATION STUDIES

W. L. Seitz, S. C. Schmidt, and J. Wackerle 1978 23 p refs Presented at the Meeting on Phys. of Explosives, Los Alamos, New Mexico, 9 May 1978

(Contract W-7405-eng-36)

(LA-UR-78-2279; Conf-7805125-1) Avail: NTIS HC A02/MF A01

Both pulsed laser stereophotography and streak camera studies were used to determine a foil/land/flyer geometry that will give sufficiently planar flyers for quantitative explosive initiation studies. A shot assembly with explosive wedges 6.4-mm diam and 20 to 30 deg angles was designed to study run distances to detonation from 0.5 mm to 2.0 mm. Preliminary results are given for 1.8-g/cu cm superfine TATB. DOE

N79-32378# Sandia Labs., Albuquerque, N. Mex.

PASSIVATION OF THE PYROTECHNIC FUELS TITANIUM AND TITANIUM HYDRIDE IN OXIDATIVE ENVIRONMENTS

R. K. Quinn 1978 15 p refs Presented at 6th Pyrotechnics Seminar, Estes Park, Colo., 17 Jul. 1978

(Contract EY-76-C-04-0789)

(SAND-78-0264C; Conf-780706-1) Avail: NTIS HC A02/MF A01

The chemical and physical properties that govern the performance and sensitivity of pyrotechnic materials were studied. The oxidation of Ti and TiH surface shows that electrochemical oxidation and air oxidation produce similar oxide coatings. The electrochemical process produces no extraneous results or products. There are no solvent effects on the electrochemical or surface analytical results. The first 20-50 A of Ti and TiH sub x electrodes exposed to air or electrolyte solution were identical. The oxide on or near the surface was mixed and not totally oxidized to TiO2. A full range of oxides was observed from TiO to TiC2. This observation was true for powder and bulk Ti and TiH sub x, as well as films. DOE

N79-32379# Marquette Univ., Milwaukee, Wis.

THERMODYNAMIC-ECONOMIC ANALYSIS OF THE SYNTHANE PROCESS

R. Gaggioli, L. Rodriguez, and W. Wepfer Nov. 1978 104 p refs

(Contract EY-77-S-02-4589)

(COO-4589-1) Avail: NTIS HC A06/MF A01

An exhaustive Second Law analysis of the synthane process is presented, including an efficiency and a costing study, both based on the available energy concept. The analysis shows an overall process efficiency of 46%. For 100 kwhr of useful energy supplied with coal, 51 kwhr are consumed driving the various unit operations while effluents carry 3 kwhr. The conceptual design of units clearly leads to inordinately high costs for utilities (steam, power, oxygen), compared to common utility costs readily attainable even with more expensive fuels. A preliminary recosting, assuming reasonable (yet conservatively high) costs of utility production, showed that product gas cost would be reduced from 2.1 cents/kwhr to 1.7 cents/kwhr, readily. DOE

N79-32380# Institute of Gas Technology, Chicago, Ill.

DEVELOPMENT OF COMBUSTION DATA TO UTILIZE LOW-Btu GASES AS INDUSTRIAL PROCESS FUELS. PROJECT 8985 SPECIAL REPORT NO. 3, NOZZLE-MIX BURNER

R. T. Waibel and E. S. Fleming Aug. 1978 44 p refs

(Contract EX-76-C-01-2489)

(FE-2489-31) Avail: NTIS HC A03/MF A01

Data were gathered to determine the performance of a nozzle-mix type burner when retrofit with low- and medium-Btu gases. The burner was fired on the pilot scale test furnace with a load simulating an instant during the heat-up cycle of an annealing furnace. The low- and medium-Btu gases simulated for these combustion trials were Koppers-Totzek oxygen, Wellman-Galusha air, and Winkler air fuel gases. All three substitute fuel gases produced stable flames at the full rated burner input of 3.25 million Btu/hr, although, the Winkler air fuel gas flame would blow off with a small increase in excess air or a decrease in fuel heating value per cubic foot. Koppers-Totzek oxygen fuel gas performed as well as natural gas with the same thermal efficiency and even higher flame temperatures. The Wellman-Galusha and Winkler air fuel gases each exhibited lower thermal efficiencies and flame temperatures than natural gas. DOE

N79-32381# Department of Energy, Washington, D. C. Energy Research Center.

AVIATION TURBINE FUELS, 1978

E. M. Shelton May 1979 15 p refs

(BETC/PPS-79/2) Avail: NTIS HC A02/MF A01

Properties of some aviation turbine fuels marketed in the United States during 1978 are presented. The samples represented are typical 1978 production and were analyzed in the laboratories of 15 manufacturers of aviation turbine (jet) fuels. Results for the properties of 90 samples of aviation turbine fuels are included in the report for military grades JP-4 and JP-5, and commercial type Jet A. DOE

N79-32382# Braun (C. F.) and Co., Alhambra, Calif.

FIXED BED METHANATION PROCESSES Final Report

V. P. Sirohi Aug. 1978 36 p refs

(Contract EX-76-C-01-2240)

(FE-2240-96) Avail: NTIS HC A03/MF A01

Based on the economic comparison of this study, it was concluded that the process arrangement of Hot Gas Recycle is economically attractive because it allows a maximum steam production at high pressure. The use of a high temperature catalyst results in a more economical process design in comparison with a low temperature catalyst. This is due to the increase in temperature rise across the methanator reactors, which in turn reduces the recycle flow rate, catalyst requirements, and vessel sizes. More efficienct heat recovery is also obtained. It is also concluded that the three reactor system is more economical than a single reactor mathanation process. The use of the Hot Gas Recycle with three reactors is recommended for all types of methanation catalysts. A high temperature catalyst has a further economic advantage over other catalysts. It is recommended

that such a catalyst be demonstrated commercially to confirm its potential. DOE

N79-32383# Oak Ridge National Lab., Tenn.
RECENT DEVELOPMENTS IN COAL LIQUEFACTION IN THE UNITED STATES
L. E. McNeese, L. E. Salmon, and H. D. Cochran, Jr. 26 Feb. 1979 38 p refs Presented at 6th Energy Technol. Conf. and Exposition, Washington, D. C., 26 Feb. 1979
(Contract W-7405-eng-26)
(CONF-790213-5) Avail: NTIS HC A03/MF A01

The mechanisms by which the synthetic fuels industry developed were considered. It is not at all clear that natural marketplace forces are able to build the industry rapidly enough to meet the demands expected in the next 20 to 30 years. The need for government initiative was widely discussed. The need for careful consideration of the demand-time curve for synthetic liquid fuels and of the length of time required to build an industry of the size needed was emphasized. DOE

N79-32384# SRI International Corp., Menlo Park, Calif.
MISSION ANALYSIS FOR THE FEDERAL FUELS FROM BIOMASS PROGRAM. VOLUME 4: THERMOCHEMICAL CONVERSION OF BIOMASS TO FUELS AND CHEMICALS Final Report
S. M. Kohan and P. M. Barkhordar Jan. 1979 179 p refs
(SAN-0115-T3) Avail: NTIS HC A09/MF A01

The selection of the feedstock used in the analysis of thermochemical conversion technologies is discussed. Detailed technical and economic evaluation are presented of biomass conversion to electricity and steam by combustion, SNG by gasification and methanation, methanol by gasification and synthesis, oil by catalytic liquefaction, oil and char by pyrolysis, and ammonia by gasification and synthesis. DOE

N79-32385# SRI International Corp., Menlo Park, Calif.
MISSION ANALYSIS FOR THE FEDERAL FUELS FROM BIOMASS PROGRAM. VOLUME 1: SUMMARY AND CONCLUSIONS Final Report, Dec. 1978
F. A. Schooley, R. L. Dickenson, S. M. Kohan, and J. L. Jones Mar. 1979 76 p refs
(Contract EY-76-C-03-0115-131)
(SAN-0115-T2) Avail: NTIS HC A05/MF A01

An overview report on biomass derived fuels likely to achieve future market penetration and commercialization for the DOE, Solar Energy Division, Fuels From Biomass System Branch is presented. Fifteen feedstock-to-product routes were studied in detail, and economic data were summarized for 53 missions. Using a market penetration model and assuming base case feedstock availability (without federal incentives), it was determined that seven of the 53 missions studied penetrate the market in 1985, 15 missions penetrate in 2000, and 15 penetrate in 2020, producing about 0.7, 3.5, and 5.4 quadrillion Btu of useful fuel products, respectively, in each of the years. DOE

N79-32386# Pittsburgh Univ., Pa.
SCREENING OF ZEOLITE CATALYSTS FOR METHANOL CONVERSION TO LIGHT HYDROCARBONS Final Report, 1 Jan. - 30 Sep. 1978
J. T. Cobb, Jr., V. T. Coon, and P. Tipnis Sep. 1978 38 p refs
(Contract EW-78-S-02-4691)
(COO-4691-1) Avail: NTIS HC A03/MF A01

Eleven tests were performed with Zeolon 500 (chabazite) and lanthanum-exchanged Zeolon 500. During the first 300 to 800 minutes of each test, catalyst performance was examined. The independent variables explored were extent of lanthanum exchange, temperature, space velocity, and short-term aging. Selectivity was greatly affected by aging with paraffins being the major product in the first few minutes, olefins being present at intermediate times, and dimethly ether being the major product toward the end of the study period in each test. At higher temperatures, the rate of aging decreased, the maximum olefins produced increased, and the production of dimethyl ether decreased. Eleven catalyst samples were analyzed for carbon content by standard techniques and for structural features by powder X-ray diffraction. Aged samples contained about 10% carbon. Fresh samples and samples regenerated once showed 0.1% carbon and similar X-ray patterns. DOE

N79-32387# Brookhaven National Lab., Upton, N. Y.
METAL HYDRIDE TECHNOLOGY
J. J. Reilly Feb. 1979 60 p Presented at Hydrogen in Metals Intern. Meeting, Munster, W. Ger., 6 Mar. 1979
(Contract EY-76-C-02-0016)
(BNL-26047; Conf-790301-10) Avail: NTIS HC A04/MF A01

The properties and applications of systems which have proven of potential utility as hydrogen storage compounds are summarized. Specific systems discussed are magnesium alloy hydrides, iron-titanium alloys, titanium-chromium alloys, and rare earth alloys. DOE

N79-32388# Brookhaven National Lab., Upton, N. Y.
ADVANCED SYNFUEL PRODUCTION WITH FUSION
J. R. Powell and J. A. Fillo 1979 8 p refs Presented at 14th Intersoc. Energy Conversion Conf., Boston, 5 Aug. 1979
(Contract EY-76-C-02-0016)
(BNL-26130; Conf-790803-26) Avail: NTIS HC A02/MF A01

An important first step in the synthesis of liquid and gaseous fuels is the production of hydrogen. Thermonuclear fusion offers a nearly inexhaustible source of energy for the production of hydrogen from water. Depending on design, electric generation efficiencies of approximately 40 to 60% and hydrogen production efficiencies by high temperature electrolysis of approximately 50 to 70% are projected for fusion reactors using high temperature blankets. DOE

N79-32389# Battelle Columbus Labs., Ohio.
SUGAR CROPS AS A SOURCE OF FUELS. VOLUME 2: PROCESSING AND CONVERSION RESEARCH
E. S. Lipinsky, H. S. Birkett, J. A. Polack, J. E. Atchison, S. Kresovich, T. A. McClure, and W. T. Lawhon 31 Aug. 1978 315 p refs
(Contract W-7405-eng-92)
(TID-29400-2) Avail: NTIS HC A14/MF A01

Topics discussed include processing of sugar crops for the manufacture of fermentable sugars; conversion of fermentable sugars into ethanol considered from both a technical and economic viewpoint; and research and development implications of the technical and economic results. Appendices provide equipment lists, materials and energy balances, and costs for the manufacture of ethanol from sugercane and from molasses, using state-of-the-art technology. Ethanol from sugarcane or sweet sorghum is unlikely to be available in large quantities for less than $1.00 per gallon because improvements in sugar crop production and processing are needed to hold the raw material costs for ethanol to $0.70 per gallon. When reasonable provisions are made for fermentation, distillation and return on investments, the target of $1.00 per gallon appears appropriate. There are opportunities to manufacture liquid motor fuels other than ethanol from sugar crop juice and/or associated lignocellulosic fractions. Typical alternatives are 2,3-butanediol, ketones derived from short-chain fatty acids, and microbial oils. DOE

N79-32390# TRW, Inc., McLean, Va. Energy Systems Planning Div.
METHANE RECOVERY FROM COALBEDS PROJECT TECHNOLOGY TEST PROJECTS EVALUATION OF CANDIDATE PROJECTS
Feb. 1979 26 p
(Contract EW-78-C-21-8089)
(DOE/TIC-10128) Avail: NTIS HC A03/MF A01

Of twelve candidate methane recovery projects evaluated, eight have sufficient information for a fair ranking. Three of the other four had concepts which did not offer any features not found in the eight ranked projects. The four projects recommended for further pursuit were selected on the basis of potential technology gains, economics, transferability of generated data, and on the potential for evolving widely used concepts. The selected projects are: (1) Occidental Research/Island Creek Coal - horizontal boreholes in advance of mining; (2) Bethlehem Mines - vertical wells in advance of mining; (3) Waynesburg College - multiple completion technology project; and

(4) Pennsylvania Energy Resources - multiple completion, multiple wells in anthracite. The major features of these projects are described. DOE

N79-32391# Institute of Gas Technology, Chicago, Ill.
PEAT GASIFICATION: AN EXPERIMENTAL STUDY
D. V. Punwani, S. P. Nandi, L. W. Gavin, and J. L. Johnson 1978 34 p refs Presented at the 85th Natl. Meeting of the Am. Inst. of Chem. Engr., Philadephia, 4-8 Jun. 1978
(Contract EX-76-C-01-2469)
(CONF-780611-8) Avail: NTIS HC A03/MF A01

Compared to lignite, peat is several times more reactive and makes four times as much light hydrocarbon gases during initial short-residence-time (5 seconds) hydrogasification. Compared to coal (at temperatures above 1440 F), hydrogen pressures above 4 atmospheres are relatively less essential for increasing light hydrocarbon gas yields. On an overall basis, peat is an exceptionally good raw material for SNG production. Based on the experimental results, a conceptual commercial reactor configuration was selected which incorporates a dilute-phase, cocurrent, short-residence-time, hydrogasification stage followed by fluidized-bed char gasification with steam and oxygen. Tests in process development units are in progress. DOE

N79-32392# Sandia Labs., Livermore, Calif.
EXPERIMENTAL DETERMINATION OF THE EQUATION OF STATE OF EXPLOSIVES AND PYROTECHNICS USED IN EXFLOSIVE ACTUATORS
R. Ng Jun. 1978 21 p refs Presented at the 6th Intern. Pyrotechnics Seminar, Estes, Colo., 17-21 Jul. 1978
(Contract EY-76-C-04-0789)
(SAND-78-8628; Conf-780706-13) Avail: NTIS HC A02/MF A01

An experimental explosive chamber was designed and used for the measurement of the pressure output history of explosives and pyrotechnics in explosive actuators. The design incorporates a variable volume concept, thus enabling the simulation of the pressure-volume history of an actuator as it is used in an actual explosive valve. A pressure transducer measures the dynamic pressure while a velocity interferometer system for any reflector is used at a sensitivity of 0.021 mm/micro sec per fringe to measure the velocity of a moving actuator assembly. The simultaneous pressure and velocity data are used to calculate the pressure-volume equation of state for each explosive and pyrotechnic tested. DOE

N79-32393# Rheinische Braunkohlenwerke A.G., Cologne (West Germany). Abt. Forschung und Entwicklung.
RESEARCH AND DEVELOPMENT WORK FOR HYDROGASIFICATION OF COAL WITH NUCLEAR PROCESSING HEAT DONE IN THE FRAMEWORK OF THE PROTOTYPE NUCLEAR PROCESSING HEATER PROJECT Final Report
Lothar Schrader Bonn Bundesmin. fuer Forsch. u. Technol. Nov. 1978 120 p refs In GERMAN; ENGLISH summary
(Contract BMFT-PLE-ET-1399-C)
(BMFT-FB-T-78-25) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 25,20

A technique for coal gasification using nuclear processing heat was developed, then studied following the construction of a pilot plant for hydrogasification in a fluidized bed with an input of 100 kg coal/hr. This process for the production of synthetic natural gas or carbon monoxide and hydrogen gas containing mixtures is shown to have the advantages of saving feed coal, improving efficiency, reducing emissions, and stabilizing energy costs. The design, construction, and operation of the pilot plant are described. Components have been proven for the hydrogasification of brown coal and rock coal. Results demonstrate the suitability of this unit as a part of a large scale gasification plant. Author (ESA)

N79-32394# Bergbau-Forschung G.m.b.H., Essen (West Germany). Abt. Physikalische Chemie.
RESEARCH AND DEVELOPMENT CONCERNING STEAM GASIFICATION OF COAL: REPORT ON THE CONCEPT OF A PROTOTYPE PLANT USING NUCLEAR PROCESSING HEAT Final Report
Karl-Heinrich vanHeek Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 93 p refs In GERMAN; ENGLISH summary
(Contract BMFT-03E-1399-A/ETS-0004-1)
(BMFT-FB-T-78-29) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 19,35

The development of a coal gasification process using a high temperature nuclear reactor to meet the energy requirements of the process is described. A key point in the development is the gas generator in which the nuclear heat is transferred into a fluidized bed of coal and steam via an intermediate loop and a heat exchanger immersed in the bed. On the basis of former results concerning reaction kinetics and heat transfer, further experiments with different devices were performed and the program for the testing and the development of new alloys to be used was continued. A pilot plant (0.2 T/hr) using an electrically heated helium loop was constructed and is now in operation. The data gathered confirm the feasibility of the gas generator as well as the process and are being used for the design of bigger plants. Author (ESA)

N79-32395# Columbia Univ., New York. Dept. of Chemical Engineering and Applied Chemistry.
FOR TODAY: MEMBRANE-PRODUCED GASAHOL FOR TOMORROW: MEMBRANE-PRODUCED ALCOHOL
1979 12 p Sponsored in part by Office of Minority Business Enterprise and Agency for International Development, Wash., D. C.
(PB-295814/8) Avail: NTIS HC A02/MF A01 CSCL 21D

Conventional processes for production of fuel grade ethanol from sugars are discussed. Alcohol from grain or molasses with membrane treatment of stillages is reported. Treatment costs of stillages are presented. Membrane controlled fermentation of sugars to ethanol and membrane facilitated hydrolysis of cellulose are described. Energy and cost reductions for the processes are presented. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N79-32396 Polytechnic Inst. of New York.
A STUDY OF WIRE COATING EXTRUSION Ph.D. Thesis
Dattatray Anand Rao 1979 178 p
Avail: Univ. Microfilms Order No. 7920798

An experimental and theoretical study of the single- and double-layer wire coating extrusion through pressure-type coating die was carried out. For the experimental study, a wire coating apparatus was constructed. The measurements of wall normal stresses, the wire speed, and the melt flow rate were taken during the coating operation. The materials used for the single-layer wire coating extrusion were polyethylenes and thermoplastic rubber. For the theoretical study, the equations of motion were solved to predict the volumetric flow rate as functions of pressure gradient in the die and the rheological properties of the polymers. The velocity profiles and shear stress distribution of a molten polymer inside pressure-type coating die were predicted.
Dissert. Abstr.

N79-32397# California Univ., Berkeley. Lawrence Berkeley Lab.
RULES AND PROCEDURES FOR THE DESIGN AND OPERATION OF HAZARDOUS RESEARCH EQUIPMENT
Dec. 1978 430 p refs
(Contract W-7405-eng-48)
(PUB-3001) Avail: NTIS HC A07/MF A01

Responsibility of experimenters for safety, descriptions of the various laboratory safety organizations, and enumeration of various services available to experimenters are among the topics covered. Specific rules for the setup and operation of experimental equipment and detailed design criteria and procedures for equipment frequently encountered in the high energy physics laboratory are included. DOE

N79-32398# California Univ., Livermore. Lawrence Livermore Lab.

PRECISION MACHINING VERSUS OPTICAL PROCESS
Jack W. Pearson 27 Mar. 1979 8 p Presented at the SIRA-NPL Conf. on Advan. in Opt. Production Technol., Teddington, Middlesex, England, 24-25 Apr. 1979
(Contract W-7405-eng-48)
(UCRL-82528) Avail: NTIS HC A02/MF A01

High multiples of advantage in both time and cost make the emerging technology of advanced precision machining attractive as a fabrication process for a class of optical parts. The capability of the numerical control machine tool to cut complex geometries allows functional design improvements of optical elements over what is economically feasible by conventional optical process. Machining optical parts, however, is limited to materials amenable to the diamond tool bit, which excludes glass and ferrous metals, but includes ductile metals, plastics and a number of other materials suitable for optical elements. DOE

N79-32399# National Physical Lab., Teddington (England). Div. of Quantum Metrology.
THE AMPERE, THE KILOGRAM, AND THE FUNDAMENTAL CONSTANTS. IS THERE A WEIGHING PROBLEM?
B. W. Petley Mar. 1979 15 p refs
(NPL-QU-52) Avail: NTIS HC A02/MF A01

The difficulties of realizing the ampere and the associated problem of finding an improved method of realizing the kilogram are discussed. It is shown that better ways of measuring mass ratios with high precision will have to be developed. There are four measurements that involve the current conversion factor K and it is suggested to refine one or more of them for use as a method of maintaining, or realizing the kilogram. However, studies demonstrate that it may be premature to assume that these constants will remain the only ones to involve the kilogram. There may be some macroscopic quantum effects that could be exploited to realize the kilogram. For example, the Josephson effects in superfluid helium may yet be convincingly demonstrated and come to play as important a part in metrology as their electrical counterparts have done. Author (ESA)

N79-32400# National Physical Lab., Teddington (England). Div. of Quantum Metrology.
ACTIVITIES OF THE DIVISION OF QUANTUM METROLOGY Annual Report, 1977
1977 38 p refs
(NPL-QU-AR-77) Avail: NTIS HC A03/MF A01

Fundamental research aimed at the establishing of science related standards is reported. Fields covered include optical frequency measurement, radiometry, radiation thermometry, high temperature gas physics, and low temperature properties of materials, ultraviolet wavelength standards, environmental standards for ground level and upper atmosphere measurements, and standards for thermal conductivity. Fundamental constants and cryogenic metrology are also considered as well as the development and application of laser wavelength standards, contact thermometry, thermometer calibrations, and the precise measurement of long distances. Author (ESA)

N79-32401# National Physical Lab., Teddington (England). Div. of Quantum Metrology.
ACTIVITIES OF THE DIVISION OF QUANTUM METROLOGY Annual Report, 1978
1978 31 p refs
(NPL-QU-AR-78) Avail: NTIS HC A03/MF A01

Fundamental research aimed at the establishment of science related standards is reported. Fields covered include optical frequency measurement, radiometry, radiation thermometry, high temperature gas physics, and low temperature properties of materials. Ultraviolet wavelength standards, environmental standards for ground level measurements and upper atmospheric standards are included as well as standards for thermal conductivity. Fundamental constants and cryogenic metrology were considered. The development and application of laser wavelength standards, contact thermometry, and thermometer calibrations are also among the topics covered. Author (ESA)

N79-32402# Utah Dept. of Transportation, Salt Lake City. Research and Development Unit.
PREVENTION OF EARLY PAVEMENT DETERIORATION Final Report
Douglas I. Anderson, Dale E. Peterson, and Max L. Wiley Sep. 1978 81 p refs Sponsored in part by DOT
(PB-296337/9; UDOT-MR-78/7; FHWA/RD-79/S0855) Avail: NTIS HC A05/MF A01 CSCL 13B

The major forms and causes of early pavement distress are identified. Changes in specifications or policies to prevent the distress are recommended. Three major forms of distress in Utah were identified: (1) unstable mixes, (2) transverse cracking and (3) stripping. The VESYS IIM rutting model was found adequate in predicting dangerous levels of rutting and shoving of flexible pavements. Higher values of temperature susceptibility, and saturates content in the asphalt binder were related to greater levels of transverse cracking. The use of the COLD program in reducing temperature associated cracking was promising. Asphalt aggregate interactions were related to both unstable mixes and stripping. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N79-32403 British Broadcasting Corp., Kingswood (England).
CHANNEL ISLANDS TELEVISION PROGRAMME LINKS: THE DESIGN OF A UHF FEED ANTENNA FOR A 9.14m DIAMETER PARABOLOIDAL REFLECTOR
G. H. Millard Jul. 1979 11 p refs
(BBC-RD-1979/12) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The design of a feed antenna for a paraboloidal reflector is discussed in relation to the optimization of the gain and the likely side-lobe level. The design was realized in a practical feed antenna but the performance of the complete antenna was not assessed experimentally. M.M.M.

N79-32404 British Broadcasting Corp., Kingswood (England). Research Dept.
MODULATION-DELAY EQUALISATION APPLIED TO COMMON-FREQUENCY H.F. CIRCUITS: AN ASSESSMENT OF THE LIKELY IMPROVEMENT
D. J. Whythe Aug. 1979 8 p ref
(BBC-RD-1979/13) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Tests are described that were carried out to assess the maximum improvement that modulation-delay equalization, of the type that were found beneficial for m.f. broadcasting, could provide for reception of common-frequency h.f. broadcasting. The tests involved tape and pen-chart recordings of special common-frequency h.f. transmissions from Daventry, Rampisham, and Woofferton that were received by the kind co-operation of RAI at their receiving station at Monza, near Milan. From an assessment of both types of recordings it was concluded that the improvement would be too small to justify the provision of modulation-delay equipment at h.f. stations. G.Y.

N79-32405 Polytechnic Inst. of New York.
GUIDED WAVE PROPAGATION IN BOUNDED INHOMOGENEOUS MEDIA Ph.D. Thesis
Ehud Navon 1979 126 p
Avail: Univ. Microfilms Order No. 7920794

The characteristics of guided modes propagating in a two-dimensional (slab) or three-dimensional (cylindrical) transversely inhomogeneous refractive index medium bounded by a homogeneous exterior region are investigated. A method of solution was developed based on the special case of an unbounded medium without the exterior domain. The method is illustrated for two and three dimensional bounded parabolic profiles, which have known exact solutions. An exact solution is furnished for the bounded two dimensional hyperbolic tangent profile. Attention in the two dimensional case is paid also to asymmetrically placed boundaries, and to the relation between that solution and the solutions for the related symmetrically bounded profiles. For the generation of high frequency asymptotic

solutions for profiles that cannot be analyzed exactly in terms of known functions, the evanescent wave method is employed.
Dissert. Abstr.

N79-32406 Polytechnic Inst. of New York, Farmingdale.
ROBUST OPTIMAL SYSTEMS IN RADAR AND COMMUNICATIONS Ph.D. Thesis
Satish Kumar Gambhir 1979 189 p
Avail: Univ. Microfilms Order No. 7920779

The design of robust systems and optimization of signals and processors under arbitrary noise conditions is considered. The robustness of performance, i.e., stability of the power of the test, is brought about by using the generalized quantile detector of which the m-Interval detector and the rank detectors are subsets. The analysis is carried out by using the discrete maximum principle and constraints are applied on the transmitter power, the receiver power, intersymbol interference, timing jitter and Gabor bandwidth. The resulting nonlinear two-point boundary-value equations are solved on a digital computer by the method of adjoints. For communications over channels with low signal-to-noise conditions and for efficient utilization of bandwidth, methods are presented to construct higher order alphabets.
Dissert. Abstr.

N79-32407 Texas A&M Univ., College Station.
MODELLING AND SYSTEM IDENTIFICATION FOR THE INPHASE/QUADRATURE PROCESS Ph.D. Thesis
Chang June Yoon 1979 151 p
Avail: Univ. Microfilms Order No. 7919121

A real-time, sampled-data processing technique to combat both natural and intentional interferences on aeronautical radio communication and data-link channels was developed. The particular detection technique used is Integrated Detection, Estimation, and Identification (IDEI). It is assumed that the received data is in the stationary Inphase/Quadrature (I-Q) form. The colored interference represents a jamming signal which is a Gaussian process. A modified diagonal transition matrix is used for the generating model. The closed-form probability of error expression under imperfect identification is derived to analyze the sensitivity of detection error. The analysis and results of the probability of error of the IDEI detector are presented. The mathematical derivation and results for the Maximum Likelihood Identification of the stationary I-Q process are presented.
Dissert. Abstr.

N79-32408*# National Aeronautics and Space Administration. Pasadena Office, Calif.
BASEBAND SIGNAL COMBINER FOR ANTENNA ARRAY Patent Application
Mahlon F. Easterling (JPL) and Robin A. Winkelstein, inventors (to NASA) (JPL) Filed 18 Sep. 1979 21 p
(Contract NAS7-100)
(NASA-Case-NPO-14641-1; US-Patent-Appl-SN-076643) Avail: NTIS HC A02/MF A01 CSCL 17B

A method and apparatus for combining baseband signals from a large aperture antenna array in which none of the individual baseband signals has a sufficiently high signal-to-noise ratio is disclosed. The invention provides a means whereby the baseband output signals of all but one of the receivers associated with each of the antennas are summed and used as a correlation reference for the baseband signal not contained in the summed signal. Thereby, a plurality of correlation or alignment loops is provided, each having an output signal related to the phase difference between its input baseband signal and the summed signal. The invention further provides a means for subtracting an output or error signal generated in one of the correlation loops whose baseband signal has a predetermined phase delay from all the other alignment loops, thus avoiding interaction and reflection effects in the signal combiner. NASA

N79-32409*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EVALUATION OF THE JPL X-BAND 32 ELEMENT ACTIVE ARRAY Final Report
J. F. Boreham, R. B. Postal, and B. L. Conroy 1 Aug. 1979 68 p Sponsored in part by SAMSO Original contains color illustrations
(Contract NAS7-100)
(NASA-CR-162297; JPL-Pub-79-69-Rev-1) Avail: NTIS HC A04/MF A01 CSCL 17B

Tests performed on an X-band 32-element active array are described. Antenna pattern characteristics of the array were tested in its standard operating mode as well as several degraded performance modes, including failures of 1, 2, 3, 4, 8, 16, and 31 elements. Additionally, the array was characterized with the addition of a metallic shroud, and also characterized versus rf drive level and at a single off-axis electronic beamsteered position. Characterization was performed on several of the 3/4-watt, three-stage, X-band solid-state power amplifier modules. The characterization included swept amplitude response, amplitude and phase versus temperature from -20 to +60 C, and intermodulation distortion of selected modules. The array is described and conclusions and recommendations based upon the experience and results achieved are included. J.M.S.

N79-32410*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TECHNICAL ASSISTANCE FOR LAW-ENFORCEMENT COMMUNICATIONS: CASE STUDY REPORT TWO
Norman B. Reilly and James A. Mustain 15 Aug. 1979 33 p refs Sponsored in part by LEAA
(Contract NAS7-100)
(NASA-CR-162294; JPL-Pub-79-78) Avail: NTIS HC A03/MF A01 CSCL 17B

Two case histories are presented. In one study the feasibility of consolidating dispatch center operations for small agencies is considered. System load measurements were taken and queueing analysis applied to determine numbers of personnel required for each separate agency and for a consolidated dispatch center. Functional requirements were developed and a cost model was designed to compare relative costs of various alternatives including continuation of the present system, consolidation of a manual system, and consolidated computer-aided dispatching. The second case history deals with the consideration of a multi-regional, intrastate radio frequency for improved interregional communications. Sample standards and specifications for radio equipment are provided. Author

N79-32411*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TECHNICAL ASSISTANCE FOR LAW-ENFORCEMENT COMMUNICATIONS: GRANT SUMMARY
Norman B. Reilly 15 Aug. 1979 40 p refs Prepared for LEAA
(Contract NAS7-100)
(NASA-CR-162305; JPL-Pub-79-84) Avail: NTIS HC A03/MF A01 CSCL 17B

A summary overview of project activities and results are presented. The goals and objectives are reviewed and a description of the approaches used to attain them is given. The feedback received from the seminars conducted as part of the project, and results from a questionnaire about the project are included. Significant findings of the project in such areas as radio channel loading, dispatch system design, training and technology transfer are discussed. Several specific problem areas are identified and evaluated. Specific recommendations for future technical assistance efforts are presented along with an inventory of technical-assistance reports generated throughout the project.
R.E.S.

N79-32412*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SPECTRAL CHARACTERISTICS OF CONVOLUTIONALLY CODED DIGITAL SIGNALS
Dariush Divsalar 1 Aug. 1979 85 p refs
(Contract NAS7-100)
(NASA-CR-162295; JPL-Pub-79-93) Avail: NTIS HC A05/MF A01 CSCL 17B

The power spectral density of the output symbol sequence of a convolutional encoder is computed for two different input symbol stream source models, namely, an NRZ signaling format and a first order Markov source. In the former, the two signaling states of the binary waveform are not necessarily assumed to occur with equal probability. The effects of alternate symbol inversion on this spectrum are also considered. The mathematical results are illustrated with many examples corresponding to optimal performance codes. Author

N79-32413# Mitre Corp., McLean, Va. METREK Div.
TELEHEALTH HANDBOOK: A GUIDE TO TELECOM-

MUNICATIONS TECHNOLOGY FOR RURAL HEALTH CARE Report, 29 Jun. 1974 - 30 Sep. 1977
Arthur M. Bennett and Friend L. Skinner May 1978 162 p refs
(Contract HRA-106-74-182)
(MTR-7581; DHEW/Pub/PHS-79/3210) Avail: NTIS HC A08/MF A01

Telehealth is a term applied to the use of telecommunications technology to facilitate the delivery of health care and services among remotely located, geographically dispersed, or physically confined persons. A telehealth system appears to be a potentially valuable resource for improving access to quality health care in rural areas. Telehealth systems can enhance the information exchange that is vital to providing quality health care and help reduce the professional isolation of rural providers. With emphasis on primary care, this handbook focuses on the role of telecommunications technology in the exchange of patient, educational, and administrative information within a dispersed health care system. Author

N79-32414# Federal Aviation Agency, Atlantic City, N.J.
CALCULATION OF THE CORRELATION REGION SIZE FOR USE WITH ALPHA-BETA TRACKING FILTERS
Robert E. Lefferts Apr. 1979 31 p refs
(AD-A072083; FAA-NA-79-15) Avail: NTIS HC A03/MF A01 CSCL 17/9

The design of correlation regions on a constant probability of intercept basis is examined. Assuming independent and Gaussian distributed range and azimuth errors in the sensor and assuming a constant coefficient isotropic examined tracking filter, it is shown that the design must include such factors as sensor errors, timing jitter, tracking errors, and the asynchronous operation of the tracking function with respect to the sensor measurements. Numerical results show that in the case of straight-line trajectories, the radius of a circular alpha-beta correlation region is linearly proportional to the distance from the sensor in the region where azimuthal errors predominate and is constant in the region where range errors predominate. For a maneuvering target, the size of the correlation region must be equal to the sum of the radius used for the straight-line case plus the magnitude of any tracking bias which results because of the deviation from a straight-line trajectory as assumed in the tracking filter. An upper bound is derived for the magnitude of the bias which could reasonably be expected in typical maneuvers. K.L.

N79-32415# Federal Aviation Agency, Atlantic City, N.J.
NUMERICAL STUDIES OF CONVERSION AND TRANSFORMATION IN A SURVEILLANCE SYSTEM EMPLOYING A MULTITUDE OF RADARS, PART 2
R. G. Mulholland and D. W. Stout Apr. 1979 58 p refs 2 Vol.
(AD-A072086; FAA-NA-79-18-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 17/9

Scale magnification and transformation errors are considered in the application of stereographic projection to the planar representation of target latitude and longitude relative to the reference ellipsoid in a mutiple radar surveillance system. The representation is accomplished by conversion of target altitude together with target azimuth and slant range relative to a radar into a point on a plane unique to the radar. This is followed by a transformation that carries points on the local radar plane into points on a single master plane. Transformation error is viewed as the separation of images on the master plane of the same point in the local radar plane under an ideal mapping formula and polynomial approximations. Tight upper and lower bounds are derived for the error generated by these approximations under parameter constraints consistent with the structure of practical coverage regions. J.M.S.

N79-32416# Federal Aviation Agency, Atlantic City, N.J.
NUMERICAL STUDIES OF CONVERSION AND TRANSFORMATION IN A SURVEILLANCE SYSTEM EMPLOYING A MULTITUDE OF RADARS, PART 1
R. G. Mulholland and D. W. Stout May 1979 48 p refs 2 Vol.
(AD-A072085; FAA-NA-79-17-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 17/9

Conversion error is considered in the application of stereographic projection to the planar representation of targets in multiple radar surveillance systems. The error is treated as the separation of images in a local radar plane of target positions (in terms of altitude, azimuth, and slant range) under ideal mapping formulas and system implementations. These images are viewed as elements of a complex plane in which the center of coordinates represents the radar site. Thus, conversion error can be expressed in terms of a range error equal to the difference in moduli of two complex numbers and an angle error equivalent to the difference between the arguments of the same numbers. As the image of target position under ideal conversion traverses a circle centered on the origin of coordinates, both the angle error and the range error oscillate about median values. The amplitude of each oscillation increases with the radius of the circle. In addition, the median range error is strongly dependent upon the radius of the circle. An error correction method and a commonly used minimax technique are considered as alternative means for controlling conversion error. J.M.S.

N79-32417# Atlantic Scientific Corp., Indian Harbour Beach, Fla. Office of Naval Research.
AN INVESTIGATION INTO THE NOISE INTERFERENCE PROBLEMS AT LOGAN AIRPORT, BOSTON Final Report, Aug. 1977 - Apr. 1979
Barton J. Lipofsky, Rodney B. Bent, Sigred K. Llewellyn, and Jack Leahy (FAA, Burlington, Mass.) Apr. 1979 106 p refs
(Contract DOT-FA77WAI-774)
(AD-A072057; FAA-RD-79-58) Avail: NTIS HC A06/MF A01 CSCL 17/2

A severe noise problem exists at many air traffic control tower locations in the VHF receivers during certain severe weather conditions. The problem was theoretically investigated for Boston Logan Airport and was found to be most likely related to corona discharge from air terminals close to the receiving antennas. Elimination techniques using static dischargers at some ATCT locations were analyzed and are criticized. A detailed experimental study of the effect of corona noise on voice communications was carried out using receivers and antennas which are representative of equipment in current use at air traffic control centers. G.Y.

N79-32418# National Aviation Facilities Experimental Center, Atlantic City, N. J.
INTERIM RESULTS OF DABS/ATCRBS ELECTROMAGNETIC COMPATIBILITY TESTING Interim Report, Mar. - Jun. 1979
George Mahnken and Leo Wapelhorst Jun. 1979 101 p
(AD-A072087; FAA-RD-79-11; FAA-NA-79-180) Avail: NTIS HC A06/MF A01 CSCL 20/14

Tests were conducted and results were presented at the National Aviation Facilities Experimental Center (NAFEC) to determine what effect the implementation of the Discrete Address Beacon System (DABS) has on the performance of the Air Traffic Control Radar Beacon System (ATCRBS). Uplink tests were conducted to measure transponder suppression rates in the ACTRBS airborne environment under various DABS and ATCRBS ground interrogator site configurations. Analysis of the data collected to date indicates that suppression levels generally become lower when DABS sensors replace ATCRBS sites, thus, resulting in an improvement in the ATCRBS airborne environment. Tests were also conducted on three reply processors being used by the Federal Aviation Administration in operational facilities to process ATRCBS targets to determine processor susceptibility to DABS fruit interference. There was no indication from the resultant data of any significant degradation in performance in the presence of varying amounts of DABS fruit. M.M.M.

N79-32419# Washington Univ., Seattle. Dept. of Electrical Engineering.
MULTIPLE SCATTERING EFFECTS ON TRANSMISSION THROUGH THE ATMOSPHERE Annual Report, 1 Sep. 1978 - 31 Aug. 1979
Akira Ishimaru Jun. 1979 7 p
(Contract N00014-78-C-0723)
(AD-A070471; TR-1-ONR) Avail: NTIS HC A02/MF A01 CSCL 04/2

This annual report gives a summary of the work completed and underway on the contract covering the period from September 1, 1978 to June 1, 1979. The work is directed to

the investigation of the transmission characteristics of optical waves with wavelengths in the range of 1-15 micron through various atmospheric conditions including clouds, fog, turbulence, rain, hail, snow, and inhomogeneous layers. Progress was made in the areas of the scattering patterns of actual fog, cw plane wave solution, beam wave solution, and pulse wave solution of the optical transmission characteristics through fog. GRA

N79-32420# Mississippi State Univ., Mississippi State. Dept. of Electrical Engineering.
A STUDY OF THE EMP INTERACTION WITH AIRCRAFT OVER AN IMPERFECT GROUND PLANE Final Report
C. Taylor, V. Naik, and T. Crow May 1979 53 p refs
(Grant AF-AFOSR-3342-77; AF Proj. 3763)
(AD-A070388; AFWL-TR-78-163) Avail: NTIS HC A04/MF A01 CSCL 18/3

The study of thin wire configurations, in particular the isolated single wire and crossed wires, above the ground plane has been conducted utilizing analytical techniques primarily. The formulation is based on transmission line theory and the singularity expansion method (SEM). Natural frequencies, natural current modes and coupling coefficients are determined. These results are compared with the results obtained by earlier investigators using conventional numerical techniques. GRA

N79-32421# Electronics Research Lab., Adelaide (Australia).
PREDICTING TRANSIONOSPHERIC PROPAGATION CONDITIONS
D. G. Singleton Nov. 1978 39 p refs
(AD-A070283; ERL-0049-TR) Avail: NTIS HC A03/MF A01 CSCL 20/14

A scheme is developed for predicting propagation conditions on transionospheric circuits. The scheme combines a realistic model of F-region irregularity behavior with thin screen scintillation theory in order to simulate both the mean scintillation index and the probability of the signal falling below a nominated level. Consideration is given to the application of the prediction scheme to transionospheric circuits terminated by a synchronous satellite at 176.5 deg E (e.g. MARASAT II) and by points on the earth's surface within an area bounded in latitude by 30 N and 65 S and in longitude by 75 E and 270 E. The diurnal and seasonal variations of the probability of disruption of such circuits is investigated under varying conditions of magnetic and sunspot activity. It is concluded that circuits, which terminate in a large and strategically important equatorial region and a small high latitude region, are likely to be disrupted at night. In the equatorial region the possibility of disruption is (a) highest during the equinoxes, (b) reduced by magnetic activity and (c) particularly severe during years of high sunspot activity. The bearing these factors have on the operational use of transionospheric circuits is briefly discussed. GRA

N79-32422# Rome Air Development Center, Griffiss AFB, N.Y.
RADIATION PATTERN SIDELOBES AND NULL FILLING PRODUCED BY AIRCRAFT VIBRATION
Ronald L. Fante Jan. 1979 21 p ref
(AF Proj. 2305)
(AD-A070472; RADC-TR-79-6) Avail: NTIS HC A02/MF A01 CSCL 20/14

We have studied the effect of the temporal vibrations of an array of radiators on their radiation pattern. Results are obtained for both large and small vibration amplitudes in the limit when the vibrations are periodic. In general the vibration-induced sidelobe levels are found to depend on the size of the vibration in wavelengths, the spatial distance over which the vibrations are correlated, and the number of elements in the array. GRA

N79-32423# Naval Postgraduate School, Monterey, Calif.
COMPUTER NETWORKS M.S. Thesis
Ronald Brent Kurth Mar. 1979 134 p refs
(AD-A070223) Avail: NTIS HC A07/MF A01 CSCL 09/2

Computer networks are being used in many varied applications. Chapter I of this thesis examines network topologies, components, and design goals. The remaining three chapters are dedicated to a case study of the Naval Postgraudate School's (NPS) computer system. Computer system performance measuring tools for terminal oriented systems are discussed and one is selected for the study. The NPS system is analyzed, shortcomings identified and possible solutions suggested. Finally, two network designs are proposed for a terminal oriented system that is suitable for satisfying the needs of the NPS. GRA

N79-32424# Rome Air Development Center, Griffiss AFB, N.Y.
METAL GRID ANGULAR FILTERS FOR SIDELOBE SUPPRESSION
Robert J. Mailloux and Peter R. Franchi Jan. 1979 19 p refs
(AF Proj. 4600)
(AD-A070111; RADC-TR-79-10) Avail: NTIS HC A02/MF A01 CSCL 09/5

This report presents an analysis, design data and preliminary experimental results that demonstrate the use of metal grid angular filters for sidelobe suppression. These results indicate that sidelobe suppression in excess of 30 dB is achievable within 20 deg of the transmission pass band. Author (GRA)

N79-32425# Lincoln Lab., Mass. Inst. of Tech., Lexington.
CORRELATION TECHNIQUES FOR DEEP SPACE UNCORRELATED TARGETS
Ramaswamy Sridharan, William P. Seniw, and Aubyn Freed 13 Mar. 1979 31 p refs
(Contract F19628-78-C-0002)
(AD-A071014; TN-1979-24; ESD-TR-79-37) Avail: NTIS HC A03/MF A01 CSCL 17/9

The surveillance fences of SPACETRACK detect and track a large number of space objects that do not correlate with known objects in the satellite catalog. This note describes the techniques developed at the Millstone Hill Radar for the analysis of these uncorrelated targets. GRA

N79-32426# Lincoln Lab., Mass. Inst. of Tech., Lexington.
BISTATIC SCATTERING REFLECTION ASYMMETRY AND POLARIZATION REVERSAL SYMMETRY
Gregory E. Heath 17 Apr. 1979 42 p refs
(Contract F19628-78-C-0002)
(AD-A071008; TN-1979-4; ESD-TR-79-44) Avail: NTIS HC A03/MF A01 CSCL 17/9

Circularly polarized bistatic scattering from plane-symmetric targets with otherwise arbitrary electrical properties exhibits reflection asymmetries and polarization reversal symmetries which are useful for bistatic radar data interpretation. In addition, the symmetries can be used to reduce the time and expense in obtaining bistatic scattering data from static range measurements and theoretical or computer calculations. The reflection asymmetry and polarization reversal symmetry relations are derived in this note. The symmetry relations are then combined with the principle of electromagnetic reciprocity to determine the minimum number of measurements needed to completely characterize target scattering. GRA

N79-32427# Harry Diamond Labs., Adelphi, Md.
USER'S MANUAL FOR SCWAR: A MULTIWIRE SHIELDED CABLE CODE FOR A SYSTEMS ORIENTED EMP VULNERABILITY ASSESSMENT PROGRAM
Michael J. Vrabel May 1979 75 p ref
(DA Proj. 1L1-62120-AH-25)
(AD-A070884; HDL-TR-1887) Avail: NTIS HC A04/MF A01 CSCL 17/4

SCWAR is a shielded multiwire cable code for a system oriented program of electromagnetic pulse (EMP) vulnerability assessment and hardening. Two versions of the code are presented with the larger capable of handling upward of 59 wires. SCWAR interfaces with the output of a single-wire cable code to generate sufficient data for a Thevenin or Norton equivalent circuit for any conductor pair, wire to wire or wire to shield. Provisions are included to introduce cable loss terms and to ease the difficulties associated with interfacing the output with a circuit analysis code. The code is intended to complement an earlier theory-oriented report: The Multiwire Shielded Array--Theory and Code (Harry Diamond Laboratories HDL-TR-1873, October 1978). Included with the code is full user documentation. GRA

N79-32428# Environmental Research Inst. of Michigan, Ann Arbor.
MEASUREMENTS OF BISTATIC CLUTTER CROSS SECTION Final Technical Report, 21 Sep. 1977 - 30 Jun. 1978
R. W. Larson, F. Smith, A. Fromm, A. Maffett, and R. C. Heimiller

May 1979 228 p refs
(Contract F30602-77-C-0145; AF Proj. 0071)
(AD-A071193; ERIM-130300-15-F; RADC-TR-79-15) Avail: NTIS HC A11/MF A01 CSCL 17/9

The work reported utilized the air-ground bistatic instrumentation developed previously under contract F30602-76-C-0037. Empirical data have been obtained from which estimates of the bistatic reflection coefficient have been determined. Measurements were made over snow covered terrain and over an orchard with snow cover. The snow covered terrain area was the same area of tall weeds and rough ground utilized during the 1976 measurements. Data were obtained at incident and reflective angles of 80, 70 and 60 deg (low grazing angles) and 0-180 deg azimuth angle. Measurements were made at 3 cm and 23 cm wavelengths with horizontal polarization. Both like and orthogonal polarizations were received at each wavelength; four channels of data were recorded. The measurements technique utilized an aircraft with 3 cm and 23 cm pulsed transmitters and four channel receivers on a ground based tower. Coherent signals were recorded by utilizing a separate air ground link for the receiver local oscillator signal. Approximately 146 data curves are given. GRA

N79-32429# SHE Corp., San Diego, Calif.
THE 3 KHz SQUID RECEIVER DEVELOPMENT Final Report, 3 Aug. 1977 - 15 Apr. 1978
M. B. Simmonds, W. A. Fertig, and R. P. Giffard May 1978 64 p
(Contract N00173-77-C-0210)
(AD-A069709; SHE-77-60001; NRL-542226) Avail: NTIS HC A04/MF A01 CSCL 09/5

We have designed and tested a model for a 3 kHz receiver using a superconducting antenna circuit and a SQUID (Superconducting Quantum Interference Device) amplifier. Q factors as high as 6400 have been demonstrated for the resonant antenna, giving it an extremely low intrinsic noise voltage. We have analyzed and solved various problems of matching between antenna and SQUID, as well as measuring noise, contributed by materials in the surrounding cryostat. We have been able to use feedback from the SQUID amplifier into the antenna to effectively broaden the 3 dB bandwidth to 1200 Hz without raising the noise level of the system significantly. By scaling the results obtained with our model receiver to an antenna volume of .022 M-cubed we have been able to estimate that a noise level of 2.4 x 10 to the -17th power T/(sq.rt. Hz) could be obtained in a 100 Hz bandwidth. GRA

N79-32430# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
COMMAND AND CONTROL RELATED COMPUTER TECHNOLOGY: PACKET RADIO Quarterly Progress Report, 1 Sep. - 30 Nov. 1978
M. Beeler, J. Burchfiel, R. Perlman, W. W. Plummer, and V. Strazisar May 1979 22 p
(Contract MDA903-75-C-0180; ARPA Order 2935)
(AD-A070447; BBN-4124; QPR-16) Avail: NTIS HC A02/MF A01 CSCL 17/2

This document describes progress on development of a packet radio network. Activities reported include work on Station Software and Internetworking Research and Development. GRA

N79-32431# Ohio State Univ., Columbus. Electroscience Lab.
COMMUNICATION APPLICATION OF ADAPTIVE ARRAYS Final Report
R. T. Compton, Jr. Jan. 1979 10 p ref
(Contract N00019-78-C-0131)
(AD-A070181; ESL-710929-5) Avail: NTIS HC A02/MF A01 CSCL 17/2

This report describes progress under Naval Air Systems Command Contract N00019-78-C-0131 during the final quarterly period. Research on the use of adaptive arrays in conventional communication systems is summarized. GRA

N79-32432# South Carolina Univ., Columbia. Dept. of Mathematics, Computer Science and Statistics.
ASYMPTOTIC ROUNDS FOR SOLUTIONS TO A SYSTEM OF DAMPED INTEGRODIFFERENTIAL EQUATIONS OF ELECTROMAGNETIC THEORY Interim Report
Frederick Bloom 28 May 1979 28 p refs Submitted for publication
(Grant AF-AFOSR-3396-77; AF Proj. 2304)
(AD-A070132; AFOSR-79-0723TR) Avail: NTIS HC A03/MF A01 CSCL 20/3

For the system of damped integrodifferential equations which govern the evolution of the electric induction field in a class of rigid holohedral isotropic dielectrics of the type introduced by Toupin and Rivlin, conditions on the memory functions are deduced which imply that the L2 norms of such induction fields are bounded away from zero even as the damping grows in an unbounded manner. Explicit lower bounds for the L2 norms of the induction fields in such dielectrics are derived as it increases without limit. Author (GRA)

N79-32433# Texas Univ. at Austin. Electronics Research Center.
ASYMPTOTICALLY OPTIMUM ZERO MEMORY DETECTORS FOR DEPENDENT NOISE PROCESS Interim Report
D. R. Halverson and G. L. Wise 1979 6 p refs Presented at the Conf. on Inform. Sci. and Systems, 28-30 Mar. 1979
(Contract F49620-77-C-0101; Grant AF-AFOSR-3062-76; AF Proj. 2305)
(AD-A069982; AFOSR-79-0666TR) Avail: NTIS HC A02/MF A01 CSCL 20/1

Design of detectors for known signals in non-Gaussian PH1-mixing noise is considered. Applying the criterion of asymptotic relative efficiency, the design of the optimal memoryless detector is specified and is seen to depend only on second-order statistical knowledge of the noise. It is then shown that in many cases this design reduces to approximating the noise process with an m-dependent processs and obtaining the optimal nonlinearity through a limiting process. In addition, conditions are given for the existence of a unique optimal nonlinearity. GRA

N79-32434# Rome Air Development Center, Griffiss AFB, N.Y.
A STUDY OF THE SCANNING PROPERTIES OF SOME SIMPLE REFLECTIONS
Ronald L. Fante and Katherine M. Romberg Feb. 1979 28 p
(AF Proj. 2305)
(AD-A070112; RADC-TR-79-34) Avail: NTIS HC A03/MF A01 CSCL 09/5

A study has been made of the scanning properties of some singly-curved reflecting surfaces. First considered was the focal region field distribution when a plane wave is incident at various angles upon the reflecting surface. The information gained from this analysis was then used to study the scanning properties of the reflectors when sources are placed in the focal region. In particular, the parabolic cylinder was first analyzed, and it was found that this surface could be scanned only several beamwidths without severe coma lobes occurring in the radiation pattern. A modified surface was then studied and it was found that this surface could be scanned over plus or minus 10 beamwidths, simply by switching the location of the feed. GRA

N79-32435# Louisiana State Univ. and A&M Coll., Baton Rouge. Dept. of Electrical Engineering.
JAMMING SIGNAL REDUCTION IN SPREAD SPECTRUM SYSTEMS Final Scientific Report
Maurice J. Bouvier, Jr. 26 Apr. 1979 20 p refs
(Grant AF-AFOSR-3552-78; AF Proj. 2305)
(AD-A069947; AFOSR-79-0689TR) Avail: NTIS HC A02/MF A01 CSCL 17/4

A phase-locked loop based narrowband jamming signal cancellation system was built and tested to experimentally determine the degree of cancellation achievable. A reduction of 28.5 db was obtained for CW jamming signals. This is considered to be an upper limit. A reduction of 11.5 db was obtained for an amplitude modulated jamming signal. It is felt that this can be increased to 15 - 20 db with additional envelope phase control circuitry. GRA

N79-32436# Naval Postgraduate School, Monterey, Calif.
DESIGN STUDY OF A LOW PROFILE, HIGH FREQUENCY ANTENNA SYSTEM M.S. Thesis
Robert Emmett Maskell Mar. 1979 59 p refs
(AD-A070091) Avail: NTIS HC A04/MF A01 CSCL 17/2

This paper presents a design study of one method of reducing the physical size of high frequency radio antennas. The particular method utilized is that of the normal mode helical antenna. The results of tests conducted during December 1978 and January/February 1979 are listed and discussed and recommended design improvements are provided. Author (GRA)

N79-32437# Naval Postgraduate School, Monterey, Calif.
THE RADIO SPECTRUM INTERNATIONAL ALLOCATION AND REGULATION M.S. Thesis
Vernon Thomas Williams and Martin Kevin Collins Mar. 1979 131 p refs
(AD-A070110) Avail: NTIS HC A07/MF A01 CSCL 17/2

This thesis contains a study of International Radio Spectrum Allocation and Regulation with particular emphasis upon the U.S.'s relationship with the International Telecommunications Union. (ITU). The authors develop a model of the technical, political and economic aspects of the radio spectrum allocation and regulation processes. The principal elements of the model concern the benefits of use, increased demand, cost of technical expansion, technological advances and the decision making process of the international regulatory body. In particular, a significant amount of attenion is directed toward the historical development of the ITU and spectrum allocation within the framework of the authors' model. Concluding work focuses on the use of the model to determine possible U.S. courses of action with respect to future World Administrative Radio Conferences (WARC). Author (GRA)

N79-32438# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DISTRIBUTED SENSOR NETWORKS Semiannual Technical Summary Report, 1 Apr. - 30 Sep. 1978
Richard T. Lacoss 30 Sep. 1978 65 p
(Contract F19628-78-C-0002; ARPA Order 3345)
(AD-A070455; ESD-TR-78-398) Avail: NTIS HC A04/MF A01 CSCL 17/1

This report summarizes Distributed Sensor Networks research conducted during the period 1 April through 30 September 1978. One specific model for function decomposition and distribution is presented. A top level design of a strawman DSN for detecting and tracking low flying aircraft is described. High resolution acoustic signal processing algorithms for the strawman are specified and sized. Additional features of a multisite target search algorithm are presented. A moderately detailed model for simulation of an acoustic node under various scenarios is developed. New model simulation and experimental data analysis software are described and demonstrated. Technical issues involved with and plans for a digital acoustic data acquisition system are presented. Author (GRA)

N79-32439# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
DEVELOPMENT OF RANDOM CHOICE NUMERICAL METHODS FOR BLAST WAVE PROBLEMS
Harland M. Glaz 7 Mar. 1979 46 p refs
(AD-A071156; NSWC/WOL/TR-78-211) Avail: NTIS HC A03/MF A01 CSCL 19/4

Glimm's method (AD-633 551) is a relatively new numerical technique for solving hyperbolic systems of conservation laws, including those describing compressible fluid mechanics. This report contains an outline of the method, a discussion of the published numerical tests of the method, and some new numerical test results. The latter are one-dimensional models of the effects seen in blast wave propagation. The application of Glimm's method to explosion problems is studied. An appendix is included to indicate how the method can be applied to problems involving a nonideal equation of state. GRA

N79-32440# Illinois Univ., Urbana-Champaign. Electromagnetics Lab.
SOURCE RADIATION IN THE PRESENCE OF CONVEX BODIES
Safieddin Safavi-Naini and Raj Mittra Jun. 1979 132 p refs
(Contract N00014-75-C-0293)
(AD-A070827; UIEM-79-9; UILU-ENG-79-2552) Avail: NTIS HC A07/MF A01 CSCL 20/3

The first part of this work considers the problem of radiation from sources in the presence of smooth, convex, impenetrable objects and presents a brief survey of various high-frequency techniques. A generalization of the geometrical theory of diffraction and two new techniques -- based on the spectral domain approach and an asymptotic evaluation of the radiation integral for the surface current -- also are discussed. Some numerical results derived from the spectral domain formulas are presented, and a comparison with available theoretical and experimental data is included. The second part of this work describes a new technique for analyzing the radiation from a point electromagnetic source located on an infinitely conducting solid cylinder with a finite length. The method presented in this work is based upon a generalization of STD to the case of curved surfaces. GRA

N79-32441# Boeing Co., Seattle, Wash.
INVESTIGATION OF PENETRATION OF ELECTROMAGNETIC ENERGY THROUGH JOINTS IN ADVANCED COMPOSITE STRUCTURES Interim Report
D. F. Strawe and L. D. Piszker Apr. 1979 90 p refs
(Contract N00019-79-C-0058)
(AD-A069589; D180-25240-1) Avail: NTIS HC A05/MF A01 CSCL 13/5

The objectives of this effort are to conduct an investigation of the effects of electromagnetic energy on advanced composite aircraft structures and their associated avionic/electrical equipment. The primary objective of this investigation is to develop test techniques to evaluate the coupling of electromagnetic energy through joints in the composite materials within the frequency range 10 kHz to GHz. A test setup will be designed, fabricated, and checked out to perform measurements over a portion of this frequency range and joint admittance data will be obtained on a variety of strucutral joint samples. At the conclusion of this investigation, the test fixture will be delivered to NASC. GRA

N79-32442*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
A MILLIMETER WAVE ATTENUATION AND DEPOLARIZATION EXPERIMENT USING THE COMSTAR AND CTS SATELLITES Final Report, 1 May 1977 - 30 Oct. 1978
Warren L. Stutzman and Charles W. Bostian Apr. 1979 55 p refs
(Contract NAS5-22577; Grant DAAG29-77-G-0083)
(NASA-CR-162315; ARO-14066.4-EL; SATCOM-79-2; AD-A069583) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report provides the results of a study of attenuation and depolarization of millimeter waves along a satellite-to-earth communication link. Specifically, (1) Detailed analysis attenuation and depolarization data from the CTS (Communications Technology Satellite) satellite downlink beacon at a frequency of 11.7 GHz, and the 19.04 and 28.56 GHz downlink beacons on the COMSTAR satellites, and (2) Development of physical models of rain attenuation and depolarization. GRA

N79-32443# International Nuclear Energy Systems Co., Arlington, Va.
ELECTROMAGNETIC FIELD AND MECHANICAL STRESS ANALYSIS CODE. APPENDIX A: PRELIMINARY CONCEPTUAL DESIGN STUDY OF THE RIGGATRON APPROACH TO FUSION POWER Final Report
31 Jul. 1978 309 p
(Contract EG-77-C-01-4068)
(DOE/TIC-4068-T2-App-A) Avail: NTIS HC A14/MF A01

The analysis of state magnetic fields in three dimensional structures and associated mechanical stresses produced by the anti J x anti B forces within these structures is presented. The electromagnetic problem is solved in terms of magnetic vector potential A for a given current density anti J as curl 1/micron curl anti A = anti J considering the magnetic permeability as constant. The Coulombian gauge was chosen and was implemented through the use of Lagrange multipliers. The second stage of the problem - the calculation of mechanical stresses in the same three dimensional structure is solved by using the same code with few modifications - through a restart card. Body forces anti J x anti B within each element are calculated from the solution of the first stage run and represent the input to the second stage run which will give the solution for the stress problem. DOE

N79-32444# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.

MEASUREMENT OF THE VELOCITY OF SMALL PROJECTILES USING MICROWAVES [ZUR GESCHWINDIGKEITSMESSUNG KLEINER TEILCHEN MITTELS MIKROWELLEN]

K. Kaufmann Apr. 1977 17 p refs In GERMAN
(TUM-LRT-RT-TB-77/01) Avail: NTIS HC A02/MF A01

Methods and techniques applicable to the determination of micrometeorite characteristics in space are studied. Simulation experiments were performed with 0.1 to 1 mm diameter spherical projectiles (glass or metal) accelerated up to 20 km/sec. Reflection cross sections (at different wavelengths), antenna performance (with a parabolic mirror or a lens for enhanced directional operation), signal generation, and choice of frequency were investigated. A 70 to 140 GHz band was selected (cost optimization trade-off). Projectile velocity measurements with a Doppler-Radar-System (with mixer) are described as is the system (incorporating a reflection grating) used, to assure the triggering of a camera at the correct time for projectile photographs. Author (ESA)

N79-32445# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Hauptabt. Raumfahrtprogramme.

SIMULATION OF COMMUNICATIONS SYSTEMS FOR TV TRANSMISSION, EXCHANGE OF RADIO PROGRAMS, AND LONG-DISTANCE TELEPHONY Final Report

Wolfgang Kriegl, Hans Loehle, and Udo Wolff Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 91 p refs In GERMAN; ENGLISH summary
(Contracts BMFT-WRT-1075; DFVLR-BPT-01-YC-015)
(BMFT-FB-W-78-27) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 18,90

A FORTRAN 4 computer program for the simulation of the implementation of a communications system for telephony, data transmission, exchange of television programs with or without radio, and community reception of TV for any country in the world is presented. The simulation program compares for a desired coverage area implementations by means of communication satellites and or long distance terrestrial networks. Besides the most important technical date, the program furnishes a cost analysis so that a cost optimal system can be found. Thus the simulation program can be regarded as an objective decision making tool for the implementation of communication systems. In order to obtain meaningful results from the simulation program a detailed preparation of the inputs is necessary. For this, whenever possible, exact population statistics to provide a complete traffic model are used. The structure of the program is such that some subsystems are automatically optimized by the computer and the complete optimal solution can be obtained by variation of the input parameters in several simulation runs. Author (ESA)

N79-32446# National Physical Lab., Teddington (England). Div. of Computer Sciences.

THE CONCLAVE COMPUTER TELECONFERENCING SYSTEM

Mark Dowson May 1978 32 p refs
(NPL-COM-107) Avail: NTIS HC A03/MF A01

These facilities make it possible for a number of geographically separated participants to take part in a discussion using visual display terminals connected to the host computer via a communications network. The structure of CONCLAVE, including entry, reception of messages and display of CONCLAVE records, generating a contribution or message, and control (the chairman's facilities) are discussed. Experiments with CONCLAVE are listed and results examined, notably the European Information Network demonstration. Finally, the software behind CONCLAVE is explained and some CONCLAVE display formats are shown. Author (ESA)

N79-32447# Universite Catholique de Louvain (Belgium). Lab. de Telecommunications et d'Hyperfrequencies.

ATMOSPHERIC PROPAGATION RESEARCH AT 20 AND 30 GHz Final Report

A. VanderVorst, P. Sobieski, and P. Delogne Oct. 1978 90 p refs
(Contract ESTEC-3305/77-NL-AK(SC))
(ESA-CR(P)-1201) Avail: NTIS HC A05/MF A01

One hundred and four articles are presented and a review is given of the present knowledge with respect to 20 and 30 GHz slant path propagation. The survey is limited to slant path and covers the frequency range from about 15 to 40 GHz. Experiments are presented first by location, which gives a more synthetic view on the subject, in a decreasing order of experiment complexity, then by subject where key diagrams are also presented. The problems due to the use of the 20/30 GHz range in satellite communication systems are then investigated, to outline possible experiments. The constraints arising from the atmospheric effects on the 20/30 GHz range are reviewed for the amplitude and phase of the copolar and of the cross-polar signal, both from an instantaneous and statistical point of view, including space diversity. The areas in which coordinated research is necessary are pointed out. Author (ESA)

N79-32448# Siemens A.G., Munich (West Germany). Forschungslaboratorien.

OPTIMIZATION OF FUTURE TELECOMMUNICATION NETWORK STRUCTURES Final Report

Michael Mrva and Rudolf Nocker Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 163 p refs In GERMAN; ENGLISH summary
(Contract BMFT-NT-0630)
(BMFT-FB-T-78-55) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 34,00

The structure of communication networks was examined in order to determine the suitability for providing new services. The impact of recent advances in telecommunications technology was also taken into consideration. Network structures are classified by means of graph theory, their properties are discussed, and new structures are compared with those being used nowadays. Looking at local networks, special attention is directed towards time division multiplex systems with decentralized switching and multiplex access. Using models, comments on the integration of several services into one network are made. Computer programs as an aid for planning, especially for long distance networks, were developed. Features, such as reliability, permeance, vulnerability, line, cable and duct length, ability to extend the network, and economy were taken into account. The computer programs, also for graphic display dialogue, are listed at the end of the report. Author (ESA)

N79-32449# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.

ELECTROMAGNETIC SHIELDING FORMULAS

E. Dahlberg Feb. 1979 41 p refs Addendum to TRITA-EPP-75-27
(TRITA-EPP-79-01) Avail: NTIS HC A03/MF A01

This collection of electromagnetic shielding formulas contains simple transfer matrices suitable for calculating the quasi static shielding efficiency for multiple transverse-field and axial-field cylindrical and spherical shields. They are also useful for estimating leakage fields from long coaxial cables and the normal-incidence transmission of a plane wave through a multiple plane shield. The differences and similarities between these cases are illustrated by means of equivalent circuits and transmission line analogies. A discussion of a posible heuristic improvement on some shielding formulas is included. Author (ESA)

N79-32450# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

DESCRIPTION OF STIDAS 2-c (SPEECH TRANSMISSION INDEX DEVICE USING ARTIFICIAL SIGNALS). PART 1: GENERAL DESCRIPTION

H. J. M. Steeneken and E. Agterhuis 1978 27 p refs
(IZF-1978-19; TDCK-71457) Avail: NTIS HC A03/MF A01

A physical method determining the quality of speech transmission channels vas developed. The method quantifies preservation of the intensity fluctuations of speech in a number of parallel frequency bands. From this a physical quantity can be derived which is related to the intelligibility of speech, the Speech Transmission Index. The approach was optimized for a great number of different communication channels with disturbances such as noise, peak clipping, bandpass limiting, and digital

modulation methods. The hardware and software of the measuring are described. Author (ESA)

N79-32451# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

A PHYSICAL METHOD FOR MEASURING SPEECH-TRANSMISSION QUALITY

H. J. M. Steeneken and T. Houtgast 1979 30 p refs

(IZF-1979-1; TDCK-71718) Avail: NTIS HC A03/MF A01

A physical method for measuring the quality of speech transmission channels was developed. Essentially, the method represents an extension of the articulation index concept which was developed mainly to account for distortions in the frequency domain (noise, bandpass-limiting). The underlying concept of the present approach, based on the modulation transfer function of a transmission channel, was adapted to account for nonlinear distortions (peak clipping) as well as for distortions in the time domain (reverberation, echoes, automatic gain control). The resulting index, the speech transmission index (STI) was correlated with subjective intelligibility scores obtained on 167 different transmission channels with a wide variety of disturbances. The relative predictive power of the STI, expressed in PB-word score, appeared to be 5%. This accuracy is comparable with results obtained from subjective measurements when about four talkers and four listeners are used. Expressed in terms of signal-to-noise ratio, the accuracy is about one dB. Pilot studies were carried out to evaluate the use of the STI for testing digital speech transmission channels. Author (ESA)

N79-32452# National Physical Lab., Teddington (England). Acoustics Unit.

A DAMPED FLAT-PLATE COUPLER FOR USE IN CALIBRATING CIRCUMAURAL EARPHONES

M. E. Delany and E. N. Bazley Mar. 1979 29 p refs

(NPL-AC-90) Avail: NTIS HC A03/MF A01

Published work relating to the calibration of circumaural earphones for use in audiometry is reviewed. A theoretical analysis of an idealized circumaural cavity consisting of a loss-free rigid cylinder driven at one end by a high impedance source is given, followed by a solution for the one-dimensional case of an absorbent filled cavity terminated by finite impedance transducers. Conclusions from this theory were comfirmed experimentally. On this basis the acoustical properties and geometry of a pad of absorbent material suitable for conclusion in a flat-plate coupler to damp spurious resonances are established and recommendations towards standardization made. Response curves for typical circumaural earphones on the damped flat-plate coupler are presented. Author (ESA)

N79-32453# National Telecommunication Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.

ESTIMATES OF MAXIMUM ELECTRIC FIELD STRENGTHS IN THE AUTOMOBILE ENVIRONMENT

H. J. Leibe and D. D. Crombie Feb. 1979 35 p refs Sponsored by the Dept. of Commerce

(PB-294819/8; NTIA/Rept-79/16) Avail: NTIS HC A03/MF A01 CSCL 20N

Strong electromagnetic (EM) energy sources up into the microwave range were examined and estimates were made of maximum EM field conditions to which automobiles could be exposed. The results are meant to alert automotive engineers to potentially hazardous EM radiation that might upset on-board electronic control devices. GRA

N79-32454# National Technical Information Service, Springfield, Va.

MICROWAVE COMMUNICATION, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Report, Apr. 1976 - May 1979

William E. Reed Jun. 1979 242 p Supersedes NTIS/PS-78/0525; NTIS/PS-76/0362; NTIS/PS-75/250

(NTIS/PS-79/0525/0; NTIS/PS-78/0525; NTIS/PS-76/0362; NTIS/PS-75/250) Avail: NTIS HC $28.00/MF $28.00 CSCL 17B

Research reports pertinent to the techniques, equipment, reliability, and utilization of microwave communications are cited. Studies on microwave relays; links, data transmission, telemetry, satellite communications, multiplexing, and propagation are included. (This updated bibliography contains 234 abstracts, 62 of which are new entries to the previous edition.) GRA

N79-32455# Lister Hill National Center for Biomedical Communications, Bethesda, Md.

EVALUATION OF ECHO SUPPRESSION IN VIDEO TELECONFERENCING VIA THE COMMUNICATIONS TECHNOLOGY SATELLITE

George R. Thoma and David M. Prophet Feb. 1979 26 p refs

(PB-294965/9; LHNCBC-79-09) Avail: NTIS HC A03/MF A01 CSCL 17B

The Lister Hill National Center for Biomedical Communications encountered an echo problem during the operation of its six station network which provided full-duplex channels via the Communications Technology Satellite. The mechanisms causing echo are discussed, followed by a brief outline of technical approaches to its solution: simple loss insertion, echo suppressor, and echo canceller. The echo suppressor, being an off-the-shelf item, is the device selected to solve the problem. The problems encountered with the echo suppressor, the modifications attempted, and the solution finally adopted which involved using the echo suppressor in cascade with a voice gate amplifier are described. GRA

N79-32456# Gould Information Identification, Inc., Fort Worth, Tex.

AN 800 MHz COMMUNICATIONS SURVEY OF THE LOS ANGELES AREA Final Report

A. Balaram, W. Heathcock, and R. Hajousky Mar. 1979 108 p refs

(Contract DOT-TSC-1237)

(PB-295043/4; DOT-TSC-UMTA-79-11; UMTA-MA-06-0041-79-5) Avail: NTIS HC A06/MF A01 CSCL 17B

The suitability of using the 800-900 MHz band as the primary carrier of digital communication data pertaining to the Multi-User Automatic Vehicle Monitoring Program was studied. Testing was conducted on selected routes of the Southern California Rapid Transit District (SRTD) and specified segments in the city of Los Angeles. The results of the 800 MHz Survey indicate that: (1) multiple base stations will be required to provide the specified coverage of the six selected SCRTD bus routes; (2) the results indicate that the use of a circularly polarized antenna system does not reduce the effects of fast fades compared to vertically polarized antenna system; and (3) band rates between 1000 and 1800 BPS can be used effectively for the transmission of digital data using commercial 800 MHz mobile radios. GRA

N79-32457# Institute for Telecommunication Sciences, Boulder, Colo. Inst. for Telecommunication Sciences.

AUTOMATED DIGITAL SYSTEM ENGINEERING MODEL

L. G. Hause and D. R. Wortendyke Mar. 1979 93 p refs Sponsored in part by Army Communications-Electronics Engineering Installation Agency, Ft. Huachuca, Ariz.

(PB-294960/0; NTIA/Rept-79/18) Avail: NTIS HC A05/MF A01 CSCL 17B

A desk-top computer system and mathematical models which were used in seven programs. These programs make key calculations in the design of line-of-sight microwave systems. The models have the following ranges; bit rates up to 50 Mbits/s, carrier frequencies from 1 to 40 GHz, and path distances up to 150 km. The program calculate, tabulate and plot information about earth geometry, path profiles and ray paths, median basic transmission loss, path-loss variability, equipment gain, link performance, and system performance. Models were chosen based on their wideness of acceptance and the size and types of data base substantiating the model. Any design engineer using this model can have immediate access to calculate results corresponding to changes in design parameters. The reasons for this capability are that the programs are written for use in an interactive mode and the programs can be used by people with no experience in programming. GRA

N79-32458# Federal Communications Commission, Washington, D. C. Data Automation Div.

MICROWAVE APPLICATIONS PROCESSING SYSTEM: A USER'S GUIDE

2 Mar. 1979 100 p Supersedes FCC/DF-77/002A Sponsored by the FCC
(PB-294692/9; FCC/DF-79/003A; FCC/DF-77/002A) Avail: NTIS HC A05/MF A01

The FCC Microwave Applications Processing System (MAPS) is designed to be sufficiently general and flexible to satisfy the diverse requirements of Common Carrier and Safety & Special Radio Services with a common file structure. It contains data on current licenses and on applications, both closed and pending. Data associated with each license or application is subdivided according to function and arranged in a hierarchical set of records. License data is identified primarily by call sign and application data is identified by file number. Each subfile contains cross-referencing information that allows applications to be associated with the appropriate license and vice versa. GRA

N79-32459# Mitre Corp., McLean, Va. METREK Div.
BIOMEDICAL COMMUNICATIONS EXPERIMENTS USING THE COMMUNICATIONS TECHNOLOGY SATELLITE: EXECUTIVE SUMMARY Final Report
Roger A. Duncan Jan. 1979 33 p
(Contract N01-LM-4727)
(PB-294405/6; MTR-79W00033; LHNCBC-79-12) Avail: NTIS HC A03/MF A01 CSCL 17B

Public Health Service supported applicationss of the Communications Technology Satellite to biomedical communication are considered. An evaluation of the operational features of the system of satellite, ground stations, broadcast studios, equipment and personnel as they affected the applications (the system evaluation), the technical evaluation of the system, and proceedings of a symposium on evaluation of the CTS biomedical applications are summarized. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N79-32460 Wisconsin Univ. - Madison.
TECHNIQUES FOR OBSERVATION AND CONTROL OF HIGH VOLTAGE SPARK DISCHARGE Ph.D. Thesis
Alexander Scheeline 1978 992 p
Avail: Univ. Microfilms Order No. 7902424

Progress is reported towards the goal of control of emission from the spark discharge at the atomic level. Research was directed at understanding how inhomogeneity of optical properties of the discharge could most accurately be mapped, how spark source voltage and discharge timing could be both flexibly and precisely controlled, and how cathode vapor plumes propagate and react with the species present in a conducting spark gap. Various computational and spectroscopic instruments were used in observing and simulating the discharge. Dissert. Abstr.

N79-32461 West Virginia Univ., Morgantown.
RELIABILITY ANALYSIS AND OPTIMUM MAINTENANCE SCHEDULING OF MOLDED-CASE CIRCUIT BREAKERS Ph.D. Thesis
Enamidem Umo Ibok 1979 270 p
Avail: Univ. Microfilms Order No. 7920712

In the coal mining industry, the reliable and safe operation of the power system is of prime importance as it affects the safety of the mine personnel. In order to have a knowledge of how reliable and safe the power system is, it is necessary to obtain information on the reliability performance of the equipment in the power system. This type of information was obtained on molded-case circuit breakers which were found to have reliability problems. The reliability analysis of the breakers was carried out in the following four directions: (1) theoretical analysis; (2) maintenance records analysis; (3) field tests of the breakers; and (4) accelerated life tests. Dissert. Abstr.

N79-32462 California Univ., Irvine.
BLOCK IMPLEMENTATION OF DIGITAL FILTERS Ph.D. Thesis
Shinji Shinnaka 1979 205 p
Avail: Univ. Microfilms Order No. 7919310

A unified approach to block processing of digital signals and examination of the effects of finite word length in the block implementation of digital filters in state-space form is presented. The class of L-input, L-output systems that are used to implement a time-invariant, single-input, single-output system in block form is identified. Explicit relationships between the properties of the L-input, L-output block processor and the properties of the implemented single-input, single-output system are derived, including an explicit expression for the matrix transfer function of the block processor in terms of the scalar transfer function of the implemented single-input, single-output system. These properties and relations are independent of the form of realization of the block processor. Dissert. Abstr.

N79-32463*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MULTISTAGE DEPRESSED COLLECTOR FOR DUAL NODE OPERATION Patent Application
H. G. Kosmahl, inventor (to NASA) Filed 7 Sep. 1979 14 p
(NASA-Case-LEW-13282-1; US-Patent-Appl-SN-073579) Avail: NTIS HC A02/MF A01 CSCL 09C

A depressed collector which captures the spent electrons of a microwave transmitting tube at high efficiency in both high and low power modes of operation is provided. The end electrode has a spike extending toward the entrance electrode. Intermediate electrodes and the entrance electrode have central apertures increasing in size in a downstream direction. These electrodes capture most high power mode spent electrons. A low power mode electrode is positioned between the last intermediate electrode and the end electrode to capture low power spent electrons. This electrode has a central aperture preferably smaller but no larger than that of the last intermediate electrode. An auxiliary low power mode electrode with a central aperture larger than that of the low power mode electrode may be axially positioned between the end electrode and the low power mode electrode. The electrodes are all at voltages provided by a voltage divider connected between a negative potential and a common ground return. NASA

N79-32464*# RCA Government Communications Systems, Camden, N. J. Advanced Technologies Labs.
SILICON-GATE CMOS/SOS PROCESSING
P. Ramondetta Mar. 1979 27 p
(Contract NAS8-31325)
(NASA-CR-150319) Avail: NTIS HC A03/MF A01 CSCL 09C

Major silicon-gate CMOS/SOS processes are described. Sapphire substrate preparation is also discussed, as well as the following process variations: (1) the double epi process; and (2) ion implantation. R.E.S.

N79-32465*# RCA Government Communications Systems, Camden, N. J. Advanced Technology Labs.
DEVICE MODEL FOR FETSIM CIRCUIT SIMULATION PROGRAM
P. Ramondetta Mar. 1977 15 p refs
(Contract NAS8-31325)
(NASA-CR-150321) Avail: NTIS HC A02/MF A01 CSCL 09C

A description of the MOS transistor used in the FETSIM analysis program is presented. CMOS/SOS device parameters are included. Typical device mobilities are given as well as the empirically determined constants necessary to model second-order effect conductance variations due to gate voltage and saturated drain voltage. M.M.M.

N79-32466*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ON THE MINIMIZATION OF SPHERICAL ABERRATION IN SPHERICAL REFLECTOR ANTENNAS
Pradeep K. Agrawal Aug. 1979 15 p
(NASA-TM-80140) Avail: NTIS HC A02/MF A01 CSCL 09C

An expression for the phase error in the aperture plane of a spherical reflector was developed. The nature of this phase error over the aperture plane is discussed, and, to illustrate the usage of the expression, examples are given. J.M.S.

N79-32467*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OPTICALLY ISOLATED LOGARITHMIC NANOAMMETER CAPABLE OF FLOATING TO 5 KILOVOLTS
John C. Sturman and John C. DeLaat Washington Oct. 1979 22 p refs
(NASA-TP-1527; E-9934) Avail: NTIS HC A02/MF A01 CSCL 09C

A logarithmic current-measuring instrument was developed to measure plasma coupling currents at a common mode voltage of 5 kilovolts. Positive or negative currents can be measured from 10 to the -9th power to .001 ampere direct current. Optical isolation is used to control input switching and to provide data referenced to ground potential. Analog meter readouts as well as zero to five volt outputs are provided for peripheral data collection. Six independent channels are provided. Three measure positive currents, and three measure negative currents. Although designed for vacuum operation, it can be used equally well in air to measure low currents at high common mode voltages. K.L.

N79-32468# General Electric Co., Binghamton, N.Y. Aerospace Controls and Electrical Systems Dept.
THE 150 KVA SAMARIUM COBALT USCF STARTER GENERATOR ELECTRICAL SYSTEM Final Technical Report, 1 Jun. 1974 - 31 May 1978
David L. Lafuze, Robert C. Webb, Charles F. Triebel, George E. Brissey, and Albert C. Foss Dec. 1978 204 p refs
(Contract F33615-74-C-2037; AF Proj. 3145)
(AD-A070078; AES-11730; AFAPL-TR-78-104) Avail: NTIS HC A10/MF A01 CSCL 10/2

This report documents the development, construction and test of a 150 KVA Starter/Generator Variable Speed Constant Frequency (VSCF) electrical system which includes a solid rotor machine using rare earth samarium cobalt magnets. The system consists of the solid rotor 14-pole starter/generator which in the generate mode, is driven at 12,000 to 21,000 RPM and a cycloconverter which, converts the 9-phase variable frequency power from the generator to a high quality 3-phase, 400 Hz, 150 KVA power source. In the start mode, the cycloconverter converts 3-phase, 400 Hz power to a 9-phase variable frequency, variable voltage which is used to power the starter/generator as the equivalent of a brushless DC motor. The rotor was developed during the first phase of the program which is reported on in detail in AFAPL-TR-76-8. The generator is oil cooled and uses a selfcontained oil pump. It also includes a high speed mechanical disconnect which is solenoid operated to remove drive power and is mechanically reset at zero speed. The stator core uses 0.006 inch permendur laminations to handle high flux densities with a minimum of eddy current losses. The cycloconverter uses a dip brazed chassis, with liquid (oil) cooled cold plates for heat extraction. The major volume in the converter houses the power handling components which include 54 SCRs, 18 interphase transformers, 15 output filter capacitors and input despiker components. GRA

N79-32469# Microwave Associates, Inc., Burlington, Mass.
HIGH MICROWAVE FREQUENCY PASSIVE COMPONENTS Final Report, 30 Aug. 1976 - 11 Mar. 1977
Charles Buntschuh 3 Jun. 1977 64 p refs
(Contract N00173-76-C-0313)
(AD-A070348) Avail: NTIS HC A04/MF A01 CSCL 09/5

The report describes the design and development of the RF sections of a frequency translator and linear amplitude modulator for high band, similar to units developed for low band on Contract N00014-74-C-0066 and N0014-75-C-0814. The microwave integrated circuits developed were principally alumina microstrip. Preliminary experiments on stripline components are also described. Final performance data on the translator and modulator are given and discussed. GRA

N79-32470# California Univ., Irvine. School of Engineering.
TRANSIENT BEHAVIOR OF THE LMS ADAPTIVE FILTER-RESPONSE TO VARIABLE FREQUENCY SPECTRAL LINES
N. J. Bershad, P. L. Feintuch, F. A. Reed, and B. Fisher Apr 1979 45 p refs
(Contracts N00014-75-C-0682; N00024-77-C-6251)
(AD-A070470; TR-79-1-ONR) Avail: NTIS HC A03/MF A01 CSCL 09/2

The transient behavior of the LMS adaptive filter is studied when configured as a canceller operating in the presence of a fixed or variable complex frequency sine-wave signal buried in white noise. For a fixed frequency signal, the mean weights are shown to respond to signal more rapidly than to noise alone. For a chirped signal, a fixed parameter matrix first-order difference equation is derived for the mean weights and a closed-form steady-state solution obtained. The transient response is obtained as a function of the eigenvectors and eigenvalues of the input covariance matrix. Sufficient conditions for the stability of the transient response are derived and an upper bound on the eigenvalues obtained. Finally, the mean-square error is evaluated when responding to a chirped signal. The gain coefficient of the LMS algorithm is determined that minimizes the mean-square error for chirped signals as a function of chirp rate and signal and noise powers. GRA

N79-32471# General Electric Co., Schenectady, N. Y.
DYNAMIC EFFECTS OF AVALANCHE-GENERATED CARRIERS Final Report, 1 Oct. 1977 - 30 Sep. 1978
S. P. Yu and W. Tantraporn Mar. 1979 22 p
(Contract F49620-78-C-0008; AF Proj. 2306)
(AD-A070258; SRD-79-044; AFOSR-79-0690TR) Avail: NTIS HC A02/MF A01 CSCL 09/1

Dynamic effects of avalanche-generated carriers in transistors were investigated using a two-dimensional, time-domain computer program. Basic properties of MESFET logic devices were also studied. The primary effect of avalanche process on bipolar transistor was found to be the majority carrier current in the lateral direction of the base creating a voltage drop opposite to the more usual edge-crowding effect. Avalanche multiplication in the stationary high field domain of a GaAs FET reduces device efficiency, but is usually not a destructive mechanism. Spontaneous avalanche in the gate-drain depletion region of the GaAs FET can spread to the drain and substrate leading to device failure. The intrinsic switching frequency of a logic device could approach, but not exceed, fT. In an IC, the switching speed depends mainly on gm of the device and capacitive loading of the circuit. Nonuniformity in the device and circuit parameters up to 10% would not significantly affect IC performance. Author (GRA)

N79-32472# Erie Technological Products of Canada Ltd., Trenton (Ontario).
MANUFACTURING METHODS AND TECHNIQUES FOR MINIATURE HIGH VOLTAGE HYBRID MULTIPLIER MODULES Quarterly Progress Report, 1 Oct. - 31 Dec. 1978
B. Grant Gordon 31 Jan. 1979 41 p Prepared for Canadian Commercial Corp., Ottawa
(Contract DAAB07-76-C-0041)
(AD-A070052; QPR-10) Avail: NTIS HC A03/MF A01 CSCL 09/1

Data are presented on material and fixtures used in the fabrication of the multiplier modules. The technique of silk screening the conductive epoxy onto the components is described in the fabrication of the voltage multiplier. GRA

N79-32473# Science Applications, Inc., La Jolla, Calif.
ANALYTIC APPROACHES TO UNSTABLE RESONATORS Final Report, 15 May 1978 - 15 May 1979
J. Nagel and D. Rogovin 1979 34 p refs
(Contract F49620-78-C-0079; AF Proj. 2301)
(AD-A071024; AFOSR-79-0833TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

A method for obtaining asymptotic solutions of the unstable resonator integral equation which is valid for all values of the magnification was developed. Approximations were made on the Greens functions rather than the eigenmodes, leading to results which are easily generalized to different mirror geometries. 'Diffraction dominated eigenmodes' for resonators where each ray escapes after a few transits were differentiated from

'waveguide dominated eigenmodes' which are obtained for cavities with a large number of transits per ray. The solutions obtained were seen to agree in the appropriate limits with other asymptotic solutions, numerical results, and geometric optics predictions. To include the effects of gain, the unstable resonator equation was derived from Maxwell's equations in a polarizable medium. The resulting equations have the same structure as the empty resonator equation, and similar approximations can be used. Some features of the effects of saturation on the eigenmodes of an unstable resonator were considered. GRA

N79-32474# National Bureau of Standards, Washington, D. C. National Measurement Lab.
STANDARD PROCEDURE FOR USE OF THERMOLUMINESCENCE DOSIMETRY IN RADIATION-HARDNESS TESTING OF ELECTRONIC DEVICES Interim Report
J. C. Humphreys and S. E. Chappell Mar. 1979 74 p refs Sponsored by DNA
(AD-A071172; NBSIR-79-1723) Avail: NTIS HC A04/MF A01 CSCL 18/4

A standard recommended practice for the use of thermoluminescence dosimetry (TLD) systems has been developed. It is intended for the use of facilities that are engaged in the radiation-hardness testing of electronic components and systems. The practice has been written in the form of an ASTM standard for determination of absorbed dose in a medium as a result of photon or electron irradiation. It covers various aspects of TLD systems such as performance testing, dose calibration, and use procedures and precautions. A selected bibliography of TLD characteristics is included. GRA

N79-32475# National Bureau of Standards, Washington, D. C. Polymer Science and Standards Div.
PIEZO AND PYROELECTRIC PROPERTIES OF ELECTRETS
M. G. Broadhurst and G. T. Davis Jun. 1979 73 p Submitted for publication
(Contract N00014-79-C-0012)
(AD-A070808; TR-10) Avail: NTIS HC A04/MF A01 CSCL 20/3

Electrets with piezoelectric and pyroelectric properties can be made from thin polymer films which have the desirable properties of being flexible, strong, and light weight. The properties of electrets composed or oriented molecular dipoles in both amorphous and semicrystalline polymers are compared with monopolar electrets formed by frozen-in real charge. Models and concepts are presented which allow piezoelectric and pyroelectric response to be predicted from material properties. A two-site model of dipole alignment involving cooperativity leads to predictions for ferroelectric switching in polymers with a polar crystal form. Experimental results are reviewed and compared with predictions from the model. GRA

N79-32476# Clarkson Coll. of Technology, Potsdam, N.Y.
A SURVEY OF LSI TEST METHODOLOGY Final Technical Report, Jul. 1977 - Sep. 1978
U. V. Gumaste and R. M. Mattheyses Griffiss AFB, N. Y. RADC May 1979 122 p refs
(Contract F30602-75-C-0082; AF Proj. 2338)
(AD-A070733; RADC-TR-79-85) Avail: NTIS HC A06/MF A01 CSCL 14/2

This report discusses different test methods available for testing Logic Circuits and Large Scale Integrated Circuits LSI from Structural, Functional and Random testing viewpoints. Many test schemes have been proposed in the literature and this report attempts to classify the different test schemes into two basic approaches, namely, test generation and test application. An attempt is also made to indicate the philosophy underlying different test equipment. The report also incorporates a brief introduction to digital testing which should enable engineers unfamilar with the concepts of digital testing to read this report with minimum external references. GRA

N79-32477# Los Alamos Scientific Lab., N. Mex.
THERMOELASTIC ANALYSIS OF A SUPERCONDUCTING CABLE
P. D. Smith Sep. 1978 24 p refs
(Contract W-7405-eng-36)
(LA-7465-MS) Avail: NTIS HC A02/MF A01

The thermoelastic response of a superconducting power transmission cable when it is chilled from ambient to operating temperature is described. The cable consists of coaxial stranded conductors separated with a cylindrical dielectric. Cable and reactions and internal stresses are determined. Sample results for a hypothetical cable indicate that cable end reactions and peak stresses in the strands are sensitive to the initial helix angles and initial helix radii of the conductor strands. DOE

N79-32478# Bendix Corp., Kansas City, Mo.
LSI PROCESS DEVELOPMENT Final Report
D. W. Clements Jun. 1979 25 p refs Revised
(Contract EY-76-C-04-0613)
(BDX-613-2138-Rev) Avail: NTIS HC A02/MF A01

A general overview of the large scale integrated circuit (LSI) design process and manufacturing effort is presented. Considerations for establishing a commercial company as vendor for LSI components are discussed. DOE

N79-32479# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
DIELECTROPHORETIC LEVITATION OF SPHERES AND SHELLS
G. A. Kallio and T. B. Jones 1978 46 p refs
(Contract W-7405-eng-48)
(UCRL-13852-2) Avail: NTIS HC A03/MF A01

The effective dipole moment was calculated for small solid spheres and shells of insulating and conducting dielectric material. Steady state dc and ac solutions were obtained. The step response to a suddenly applied dc electric field was also determined. The steady state ac case was characterized by a cutoff frequency which determined whether levitation was possible for certain types of particles. Spheres and shells of various materials were levitated in ac and dc electric fields using a cusped electric field. A fixed electrode structure was calibrated by use of a dielectric liquid with known properties, and the quantitative results of numerous levitation experiments were favorably compared to the theoretical model. The frequency dependent behavior of glass microballoons was found to be generally consistent with the predictions of the model. Results with dc electric fields were inconclusive due to electroconvection, electrostatic repulsion, and long charge relaxation time constants. DOE

N79-32480# Sandia Labs., Albuquerque, N. Mex.
DIELECTRIC STIMULATED ARCS IN LIGHTNING ARRESTOR CONNECTORS
John P. Brainard and L. A. Andrews 1979 7 p refs Presented at the 29th Electron. Components Conf., Cherry Hill, N. J., 14 May 1979
(Contract EY-76-C-04-0789)
(SAND-79-0396C; Conf-790506-1) Avail: NTIS HC A02/MF A01

Several experiments were performed in order to study the dielectric stimulated arc. Pre-breakdown conduction was measured and was shown by image enhanced photography to be caused by partial discharging. The partial discharge was found to occur in high-field regions far from the breakdown site. Ultraviolet light generated by the partial discharge was shown to sympathetically initiate a surface flashover on the insulator within a few tens of nanoseconds. These studies led to a better understanding of dielectric stimulated arcs and is expected to lead to improved lightning arrestor designs. DOE

N79-32481# Los Alamos Scientific Lab., N. Mex.
ENERGY LOSSES IN A FLAT TRANSPOSED CABLE
Bernard Turck Feb. 1979 13 p refs
(Contract W-7405-ENG-36)
(LA-7635-MS) Avail: NTIS HC A02/MF A01

Extra energy losses caused by the coupling currents between strands in a flat superconducting cable that is exposed to an external changing field are derived. Special attention is given to the cable with an insulating strap interposed between the two layers of strands so as to reduce the losses. It is shown that the losses are not reduced as much as expected. DOE

N79-32482# Argonne National Lab., Ill.
SQUARE FUNCTION ANALYSIS OF THE INDUCTOR-CONVERTER BRIDGE

M. Ehsani and R. L. Kustom Mar. 1979 38 p refs
(Contract W-31-109-ENG-38)
(ANL/FPP/TM-118) Avail: NTIS HC A03/MF A01

An analysis based on unit step functions was developed, since the coil current in each of the inductor-converter bridge phases appears as bipolar rectangular pulses. The unit step function analysis leads to simple polynomial expressions relating the average coil voltages to relative timing. These derivations are shown to have the same harmonic representation as the voltages derived using a one-line, harmonic current source representation of each coil and its bridge network. The polynomial expressions are more compatible to microprocessor control than are the harmonic function expressions. DOE

N79-32483# AEG-Telefunken, Heilbronn (West Germany). Serienprodukte A. G.

PNP: PLANAR TRANSISTOR TECHNOLOGY Final Report

Dietrich Zerrweck and Nazih Peters Bonn Bundesmin. fuer Forsch. u. Technol. Nov. 1978 59 p refs In GERMAN; ENGLISH summary
(Contract BMFT-NT-372)
(BMFT-FB-T-78-20) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 12,20

The increase of junction capacitance due to the formation of inversion layers deteriorates the performance of PNP-RF devices. To prevent an increase in reverse current and junction capacitance, different methods of eliminating boron redistribution and ionic contamination were investigated. A technique for reducing boron redistribution during thermal oxidation as well as methods for preventing ionic contamination of the oxide are presented. Surface state charge density of the Si-SiO2 interface was identified as the cause of inversion layers at the collector surface of PNP silicon planar translators. A scheme for counteracting this effect is also given. Author (ESA)

N79-32484# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.

MODERN TECHNOLOGY FOR SEMICONDUCTOR DEVICES Final Report

Wolfgang Henning and Erich Pammer Bonn Bundesmin. fuer Forsch. u. Technol. Nov. 1978 76 p refs In GERMAN; ENGLISH summary
(Contract BMFT-NT-312)
(BMFT-FB-T-78-21) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 15,80

Processes and machines for chemical vapor deposition of silicon dioxide, aliminium silicate, and silicon nitride layers were developed. The quality and applications of these layers were examined. Moreover, the deposition of gold films, antimony, and arsenic from organic varnishes is described. In order to achieve a drastic increase in the frequency of planar silicon microwave transistors it was necessary to elaborate extremely shallow diffusion methods involving the application of arsenic and boron. The control of reliable multilayer metal contacts based titanium-platinum-gold interfaces is thereby of significant importance. Results obtained through the various techniques described are given to illustrate this control principle. Author (ESA)

N79-32485# Siemens A.G., Munich (West Germany). Forschungslaboratorien.

NEW FUNCTIONALLY INTEGRATED CIRCUITS Final Report

Ruediger Mueller Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 78 p refs In GERMAN; ENGLISH summary
(Contract BMFT-NT-0619)
(BMFT-FB-T-78-37) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 16,40

The design and investigation of semiconductor devices as fundamental building blocks for functionally integrated circuits are discussed. Several technologies and circuit techniques are compared with respect to packing density, delay times or time periods per logic operation, and power dissipation. Structural models as well as computer aided device models are in good agreement with measurements. The investigated examples show possibilities for circuit and application concepts, and the results serve as fundamental data for product development. Author (ESA)

N79-32486# Brown, Boveri und Cie. A.G., Heidelberg (West Germany). Zentrales Forschungslabor.

TECHNOLOGY OF INTERFACES ON SILICATE GLASS PASSIVATED SEMICONDUCTOR POWER DEVICES Final Report

Arno Neidig, Klaus Weimann, and Georg Wahl Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 136 p refs In GERMAN; ENGLISH summary
(Contract BMFT-NT-466)
(BMFT-FB-T-78-40) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 28,60

As an alternative to unstable silicon polymers, a surface passivation for p-n junctions of semiconductor power devices not hermetically sealed was developed using chemical vapor deposition (CVD) of silicate glasses from dilute mixtures of SiH4, B2H6, PH3, and O2. The CVD silicate layers which are approximately one micrometer thick fulfill all stability requirements after temperature treatment against charge instabilities caused by penetration of atmospheric water vapor. A reproducible sandblasting method was also developed for the double positive edge beveling of high voltage power thyristors because conventional negative bevel angles are limited by breakdown voltages up to 4kV. The stability of the double positive bevel angle was improved by using a combination of CVD glass and silicon polymers. Author (ESA)

N79-32487# Plessey Co. Ltd., Towcester (England). Allen Clark Research Centre.

MILLIMETER WAVE LOW NOISE FRONT END Final Report

J. Arnold and T. Vudali Jul. 1978 56 p refs
(Contract ESTEC-3143/77-NL-AK(SC))
(CD.6500636; ESA-CR(P)-1190) Avail: NTIS HC A04/MF A01

The design concepts, amplifier realization, and performance results obtained for the 35 db, 9.95 to 13.45 GHz band, GaAs amplifier are discussed. The 20 to 30 GHz band was investigated for future applications, such as the need for a low noise wideband amplifier centred at 11.7 GHz which form the I.F. amplifier following a diode mixer (converting from 29.25 GHz to 11.7 GHz). The as-built amplifier performed well, meeting the requirements for guaranteed bandwidth and providing at least 70% of the desired bandwidth. The dc consumption exceeded the specification limits due to a bias increase adopted to improve the gain at 14 GHz. Author (ESA)

N79-32488# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.

FERRITES WITH ANOMALOUS HYSTERESIS LOOPS FOR COMMUNICATION SYSTEMS Final Report

Manfred Zenger, Ingrid Hanke, Udo Wagner, and Peter Jiru Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 75 p refs In GERMAN; ENGLISH summary
(Contract BMFT-NT-0525)
(BMFT-FB-T-78-54) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 15,55

To reduce the volume of filter coils for telecommunications to a great extent, ferrites are necessary with very low losses and an improved stability in regards to time and temperature. For this purpose only Mn-Zn-ferrites with anomalous hysteresis loops seem to be favorable. Ferrites of the Perminvar type, containing small amounts of co-ions, were annealed after sintering to get very low loss characteristics and to stabilize the magnetic values. The magnetic values were then determined experimentally at 100 KHz and at 1 MHz, between 20 and 60C, and over a period of from 100 to 1000 minutes. The magnetic properties of isoperm-ferrites with a combined Sn And Ti- substitution sintered under appropriate conditions were also determined. Author (ESA)

N79-32489# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.

UNCERTAINTIES IN ADAPTIVE MAXIMUM ENTROPY

FREQUENCY ESTIMATORS
R. Jeffrey Keeler Feb. 1979 14 p refs
(PB-296131/6; NOAA-TR-ERL-405; WPL-53;
NOAA-79043005) Avail: NTIS HC A02/MF A01 CSCL 09D

Asymptotic expressions for the peak of the modified maximum entropy (ME) spectrum estimate and its corresponding normalized minimum mean squared error are given for a real sinusoid in white noise. Experimental results over the normalized frequency range f = (0,0.25) confirm the theoretical expressions. For an adaptive realization of the ME frequency estimator, the covariance of the weight error vector was used to derive the variance of the adaptive maximum entropy frequency estimator at high signal to noise ratio and the probability of obtaining an ambiguous spectrum at low signal to noise ratio. Both this variance and this probability may be kept small by using a sufficiently small alpha in this least mean square algorithm. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N79-32490 Texas Univ. at Austin.
SHEAR WAVE PROPAGATION IN UNCONSOLIDATED FLUID SATURATED POROUS MEDIA Ph.D. Thesis
David Warren Bell 1979 177 p
Avail: Univ. Microfilms Order No. 7920084

Experimental shear wave speed and attenuation measurements are reported for four sizes of well sorted glass beads and three natural sands. Measurements were obtained for both air and water saturation without application of external pressure. The speed and attenuation for each sample was determined from the charge with transducer separation of the transit time and amplitude of an acoustic pulse. The attenuation was found to vary approximately as the first power of the frequency. Various physical characteristics of the samples, including density and permeability, are reported to allow comparison of the experimental results with theoretical predictions. Compressional wave speed and attenuation measurements at 120 kHz are also provided. A viscoelastic model based on perfect coupling between the sediment grains and the pore fluid predicts the main features of the observed data. Dissert. Abstr.

N79-32491 Wesleyan Univ., Middletown, Conn.
EXTENSION OF THE HEAT PULSE TECHNIQUE TO THE MINUTE HEAT CAPACITIES OF THIN FILMS AT LOW TEMPERATURES Ph.D. Thesis
Antonio Stephen Cruz-Uribe 1979 99 p
Avail: Univ. Microfilms Order No. 7920635

The method presented relied on having addenda of low heat capacity, specifically, a silicon substrate and evaporated films for the heater and the thermometer. Signal-to-noise was enhanced with a custom-built amplifier; a superconducting thermometer, and a signal averager. The analysis introduced corrections for the various addenda and departures from a nonideal configuration. The arrival time of the temperature maximum for finite length samples and temperature moments with arbitrary locations for the heater and the thermometer are derived. The temperature dependence of the heat capacity of amorphous germanium was observed in the range of 1.1 K to 3 K. A new upper limit on the linear contribution to the heat capacity was set. The prospects for achieving reliable absolute measurements of heat capacities as low as .0001 erg/K are explored. Dissert. Abstr.

N79-32492 Polytechnic Inst. of New York.
THE MASS AND HEAT TRANSFER IN LAMINAR PULSATILE FLOW Ph.D. Thesis
Sharad Kumar Gupta 1979 178 p
Avail: Univ. Microfilms Order No. 7920781

The mass and heat transfer problem in laminar pulsatile flow is considered. The conditions under which the transfer rates in pulsatile flow increase or decrease when compared to the steady flow value are determined. Information as to when the existing theories are used to determine the frequency response of a diffusion controlled electrode is provided. The effect of diffusion in the flow direction on the overall transfer rates is examined. The mass and heat transfer problem in steady flow was considered theoretically for small values of Peclet numbers for which axial diffusion is important, and solved analytically by the technique of matched asymptotic expansions. This theory was used to obtain the quasi steady state solution for pulsatile flow. Dissert. Abstr.

N79-32493 Akron Univ., Ohio.
PNEUMATIC ATOMIZATION OF VISCOELASTIC FLUIDS Ph.D. Thesis
Robert Wen Lee 1979 173 p
Avail: Univ. Microfilms Order No. 7919412

The pneumatic atomization of Newtonian and non-Newtonian aqueous solutions in high velocity air was studied using high speed photography. Ten configurations of commercially-available two fluid nozzles, eleven solutions, eight of them non-Newtonian, were sprayed at several liquid/gas ratios. The viscoelastic nature, principally the normal stresses, was found to markedly alter the jet breakup and droplet formation. A drop-size correlation was developed showing that drop-size increases with the increasing elastic nature of a fluid and other factors such as air impingement angle, the liquid/gas feed rates. The importance of the Deborah number in the atomization process is discussed and related to other dimensionless groups. Suggestions for the design of pneumatic atomization of viscoelastic fluids are also given. Dissert. Abstr.

N79-32494 Virginia Polytechnic Inst. and State Univ., Blacksburg.
EFFECT OF COMPRESSIBILITY, SUCTION, AND HEAT TRANSFER ON THE NONPARALLEL STABILITY OF BOUNDARY-LAYER FLOWS Ph.D. Thesis
Nabil Mohamed El-Hady 1978 215 p
Avail: Univ. Microfilms Order No. 7921029

The effects of heating, suction, and compressibility on the stability characteristics of boundary layer flows within the framework of a complete nonparallel, linear, spatial stability theory was investigated. Included in the theory are disturbances due to velocity, pressure, temperature, density, and transport properties as well as variations of the fluid properties with temperature. The method of multiple scales is used to account for the nonparallelism of the mean flow and an equation is derived for the modulation of the wave amplitude with position. Stability characteristics are examined for boundary layer flows over an adiabatic flat plate to study the effect of a slight compressibility of the mean flow. The feasibility of controlling boundary layers by suction through porous strips is investigated and the results are compared with the case of continuous area suction. Dissert. Abstr.

N79-32495 Pennsylvania Univ., Philadelphia.
LAMINAR CONDENSATION PHENOMENON ASSOCIATED WITH A MOVING DROPLET Ph.D. Thesis
Jacob Nan-Chu Chung 1979 187 p
Avail: Univ. Microfilms Order No. 7919440

The heat and mass transfer effects associated with laminar condensation on a moving spherical liquid droplet were investigated by numerical and analytical techniques. The droplet is assumed to experience internal circulation. The droplet environment is taken to primarily consist of its own vapor (condensable) and a noncondensable and nonabsorbable gas. The presence of additional components in the environment such as a noncondensable but absorbable, a chemically reactive substance, and a particulate are evaluated. These latter quantities are taken to be in trace amounts. The high (Re > 100) and the low (Re < 1) Reynolds number limits governing the drop motions are included. Dissert. Abstr.

N79-32496 Akron Univ., Ohio.
STABILITY OF DENSITY WAVES IN TWO-PHASE FLOW SYSTEMS Ph.D. Thesis
Ahmet Duyar 1979 241 p
Avail: Univ. Microfilms Order No. 7920440

A theoretical analysis for the stability of density waves in a generalized two-phase flow system is developed. The analysis is

found to be applicable to a wide variety of geometrical and operational conditions, to uniform and non-uniform heat flux profiles and to systems with complete or partial evaporation of the working fluid. The homogeneous flow theory is used to develop two models. One is to determine the steady state heat flux profile and the other is to determine the stability of a generalized two-phase flow system. Both a numerical and a theoretical solution technique are introduced for the heat flux profile model. A small perturbation technique is used to obtain a linearized solution for the stability model. The necessary property profiles and transfer functions are obtained in generalized forms for a general heat flux profile. Dissert. Abstr.

N79-32497 North Carolina State Univ. at Raleigh.
THERMAL STABILITY OF NATURAL CONVECTION IN SLOTS AND FLOW DOWN AN INCLINED HEATED PLANE Ph.D. Thesis
Mohamed Abdel-Halim Mohamed Hassab 1978 223 p
Avail: Univ. Microfilms Order No. 7915532

The stability of heated fluids is investigated by the application of linear stability theory for four different problems. The effect of the convective boundary conditions on the onset of neutral instability is investigated. It is found that, for fluids having Prandtly numbers of the order of unity and less, and up to certain inclinations from the horizontal in which longitudinal rolls are dominant, increasing the Biot number stabilizes the laminar flow. The radiation effects on neutral stability are studied. Strong radiation improves stability and significantly shifts the transition angle towards horizontal for the crossover from transverse to longitudinal vortex rolls. The effects of radiation on the stability of a horizontal layer of fluid heated from below and subjected to a free-surface at the upper boundary is also included. Dissert. Abstr.

N79-32498*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LONGITUDINAL VORTICES IN A TRANSITIONING BOUNDARY LAYER
J. B. Anders and R. F. Blackwelder (Univ. of Southern Calif.) Sep. 1979 12 p refs
(NASA-TM-80161) Avail: NTIS HC A02/MF A01 CSCL 20D

Naturally occurring spanwise variations of the streamwise velocity component, characteristic of longitudinal vortices embedded in a transitioning boundary layer were explored using hot-wire anemometers. A vibrating ribbon introduced stable or unstable Tollmien-Schlichting waves into the laminar boundary layer. These damped or growing disturbances always developed a strong three dimensional pattern even though no spanwise perturbations were artificially induced. Changing the radius of the leading edge and other modifications to the flat plate, wind tunnel and boundary layer did not alter the spanwise wavelength of the vortices. Author

N79-32499*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
NONPARALLEL STABILITY OF TWO-DIMENSIONAL NONUNIFORMLY HEATED BOUNDARY-LAYER FLOWS
A. H. Nayfeh and N. M. El-Hady [1979] 37 p refs
(NASA-CR-162309; VPI-E-79.1) Avail: NTIS HC A03/MF A01 CSCL 20D

An analysis is presented for the linear stability of water boundary-layer flows over nonuniformly flat plates. Included in the analysis are disturbances due to velocity, pressure, temperatures, density, and transport properties as well as variations of the liquid properties with temperature. The method of multiple scales is used to account for the nonparallelism of the mean flow. In contrast with previous analyses, the nonsimilarity of the mean flow is taken into account. No analysis agrees, even qualitatively, with the experimental data when similar profiles are used. However, both the parallel and nonparallel results qualitatively agree with the experimental results of Strazisar and Reshotko when nonsimilar profiles are used. Author

N79-32500*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
VELOCITY FIELD OF A ROUND JET IN A CROSS FLOW FOR VARIOUS JET INJECTION ANGLES AND VELOCITY RATIOS
Richard L. Fearn (Florida Univ., Gainesville) and Robert P. Weston Oct. 1979 134 p refs
(NASA-TP-1506; L-12775) Avail: NTIS HC A07/MF A01 CSCL 20D

A subsonic round jet injected from a flat plate into a subsonic crosswind of the same temperature was investigated. Velocity and pressure measurements in planes perpendicular to the path of the jet were made for nominal jet injection angles of 45 deg, 60 deg, 75 deg, 90 deg, and 105 deg and for jet/cross flow velocity ratios of four and eight. The velocity measurements were obtained to infer the properties of the vortex pair associated with a jet in a cross flow. Jet centerline and vortex trajectories were determined and fit with an empirical equation that includes the effects of jet injection angle, jet core length, and jet/cross flow velocity ratios. K.L.

N79-32501# ARO, Inc., Arnold Air Force Station, Tenn.
VORTICITY-STREAM FUNCTION FORMULATION OF COMPRESSIBLE AND INCOMPRESSIBLE TURBULENT FLOWS Final Report, Sep. 1977 - Sep. 1978
John C. Chien AEDC May 1979 28 p refs
(AD-A070043; AEDC-TR-79-13) Avail: NTIS HC A02/MF A01 CSCL 20/4

Ducted turbulent flows with varying wall shapes are formulated with the Navier-Stokes equations written in terms of vorticity and stream function. Coordinate transformation and stretching functions are used to provide adequate resolution throughout the whole flow field. The turbulent characteristics of the flow are modeled by a low Reynolds number, two-equation k-epsilon model which is applicable in the wall sublayer as well as in the region away from the wall. In addition to the conventional Poisson-type pressure equation, a new pressure equation with both first- and second-order terms was derived from the momentum equations. A vector path function is included in the pressure equation to improve convergence and accuracy. Applications to a model wind tunnel diffuser and a sudden expansion diffuser are discussed. Good agreement with available experimental data is observed in terms of the pressure coefficient and the length of the recirculation region. GRA

N79-32502# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN EXPERIMENTAL EVALUATION OF A LASER VELOCIMETER BY THE STUDY OF TURBULENCE IN A PLANE FREE JET AT HIGH SUBSONIC VELOCITIES M.S. Thesis
Nino G. Cerullo Jun. 1979 135 p refs
(AD-A070102; AFIT/GAE/AA/79J-1) Avail: NTIS HC A07/MF A01 CSCL 20/4

This research was conducted in order to experimentally evaluate the Laser Velocimeter by comparing the results to those obtained by means of a Hot Wire Anemometer. The means used for this evaluation was a 10 x 1 cm free jet exhausting into stationary air. The velocities of interest were in the high subsonic range and all measurements were taken at 25, 50 and 75 cm from the exit plane. The parameters measured or calculated were mean velocities, turbulence intensities, Reynold's Shear Stresses, time microscale, spatial microscale, time integral scale, and spatial integral scale. The results of this research indicate that, although the Laser Velocimeter is an accurate and reliable system, its range of operation is limited in high velocities and/or turbulence intensities. It was also found that, as specified, this system not only required no 'seeding' but would also function with a filter installed in the set-up. GRA

N79-32503# Naval Research Lab., Washington, D. C.
ADINC: AN IMPLICIT LAGRANGIAN HYDRODYNAMICS CODE
Jay P. Boris 15 Jun. 1979 151 p refs
(RR0110941)
(AD-A070361; NRL-MR-4022) Avail: NTIS HC A07/MF A01 CSCL 20/4

This paper presents and describes a new software package called ADINC(ADiabatic and INCompressible flows) which is designed to solve the mass, momentum, and adiabatic energy equations for a rather general one-dimensional fluid system. A fully Lagrangian, conservative hydrodynamics algorithm is incorporated so that interfaces between different materials can

be followed accurately. The Courant timestep limit for sound waves is overcome by implicit time differencing with a quadratically convergent iteration for nonlinear time centering. Listings of the pertinent ADINC routines, and a general driver test program are included in the appendices. A rather general analytic equation of state routine is included which handles adiabatic gases, slightly compressible solids, and even the incompressible limit in adjacent cells. The test program has provision for up to five layers of material. Three test problems are presented in the appendices with representative outputs for code verification. GRA

N79-32504# Oak Ridge Gaseous Diffusion Plant, Tenn.
OPTIMUM AXIAL FLOW TAPER IN A COUNTERCURRENT GAS CENTRIFUGE
E. VonHalle 1 Feb. 1979 39 p refs
(Contract W-7405-eng-26)
(K/OA-4445) Avail: NTIS HC A03/MF A01

The effect of an axially varying countercurrent circulation rate in a gas centrifuge on the efficiency factors, e/sub I/, the ideality efficiency, and e/sub C/, the circulation efficiency, is investigated and compared with the case in which the countercurrent circulation rate is constant throughout the centrifuge. The optimum variation of the centrifuge parameter m, which is a measure of the countercurrent circulation rate, as a function of axial position in the centrifuge is determined. It is shown that when the countercurrent circulation rate has its optimum value at every axial position in the centrifuge, the product of the efficiency factors, e/sub I/ x e/sub C/, can exceed 81 per cent, the nominal upper limit of the value of the product of the efficiency factors for a constant countercurrent circulation rate, and can be quite close to unity. This is illustrated by numerical examples. DOE

N79-32505# Binary Systems, Inc., Salida, Colo.
FURTHER RESULTS ON AN ARRAY DESIGN TO MEASURE THE WAVENUMBER-FREQUENCY SPECTRUM BENEATH AN AXISYMMETRIC TURBULENT BOUNDARY LAYER Final Report
Lowell W. Brooks 5 Feb. 1979 75 p refs
(Contract N00014-72-C-0318)
(AD-A071048; BR-79-01) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report describes the requirements on a flush mounted array designed to measure the wavenumber-frequency spectrum of the axisymmetric component of wall pressure beneath an axially towed cylinder. Measurement of the low wavenumber content is emphasized. The effect of the wavenumber spectral dynamic range as well as channel-to-channel amplitude, phase and position tolerances are evaluated. GRA

N79-32506# Biphase Energy Systems, Inc., Santa Monica, Calif.
ANALYSIS OF TWO-PHASE FLOW IN NOZZLES AND TURBINE BUCKETS Final Report, 1 Jul. 1978 - 30 Apr. 1979
E. Ritzi 1 Jun. 1979 104 p refs
(Contract N00014-78-C-0649)
(AD-A070754; Rept-108-F) Avail: NTIS HC A06/MF A01 CSCL 20/4

A one dimensional analytical study was made of the two-phase flow of wet steam in a convergent-divergent nozzle with negligible wall friction. The liquid phase is assumed to consist of a cloud of spherical droplets, whose size is either controlled by a critical Weber number or predetermined. Nozzle geometry, phase velocities, mass flux density and local efficiencies are determined by numerical integration from the basic differential equation. The two dimensional two-phase flow in impulse turbine buckets was also investigated. The parameters that control the deviation angle of the droplets from the gas path are identified. GRA

N79-32507# Martin Marietta Labs., Baltimore, Md.
UNSTEADY BOUNDARY LAYER SEPARATION
K. C. Wang Apr. 1979 70 p refs
(Contract N00014-77-C-0650)
(AD-A070742; MML-TR-79-16c) Avail: NTIS HC A04/MF A01 CSCL 20/4

A new separation criterion for two dimensional unsteady boundary layers is proposed here. This criterion is derived by analogy, from its counterpart for steady, three dimensional boundary layer. Analogous limiting streamlines for the unsteady, two dimensional case are first defined, and an envelope of these streamlines is used to signify unsteady separation. To demonstrate this procedure, two previously studied problems are recalculated here. These are the unsteady responses to (1) a sudden change in velocity in Howarth's problem, and (2) an impulsively-started circular cylinder. Our conclusion regarding separation for the cylinder problem disagrees with that of the Telionis and Tsahalis based on the singularity criterion, but appears to be consistent with the prediction of Proudman and Johnson. Finally, we propose a three dimensional, unsteady separation criterion on the basis of repeated applications of either the steady, three dimensional separation criterion at successive times or the unsteady, two dimensional separation criterion at fixed coordinate planes. GRA

N79-32508# Naval Research Lab., Washington, D. C.
LINEAR STABILITY OF SELF-SIMILAR FLOW: 5. CONVECTIVE INSTABILITY IN BOUNDED UNIFORM SELF-GRAVITATING SPHERES Interim Report
I. B. Bernstein and David L. Book 6 Jun. 1979 14 p
(RR0110941)
(AD-A070709; NRL-MR-4018) Avail: NTIS HC A02/MF A01 CSCL 20/4

A new type of instability, similar to thermal convective instabilities, has been found to occur in self-gravitating spherical clouds uniformly expanding or collapsing in a vacuum. Unlike the Jeans instability, it has a growth rate which increases with zonal mode number 1, so that objects of arbitrarily small size are unstable. The modes are compressional and have non-vanishing vorticity. The eigenfunctions peak at the boundary, so the perturbations develop predominantly into surface irregularities. The perturbation amplitudes grow algebraically at first, then at late times become proportional to the cloud radius R(t). For a collapsing system in which stars are produced by the condensation of diffuse matter the theory predicts fragmentation and enhanced condensation in the peripheral regions. GRA

N79-32509# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
LIQUID FUEL JET INJECTION INTO A SIMULATED SUBSONIC DUMP COMBUSTOR Interim Report
John C. Ogg and Joseph A. Schetz May 1979 59 p refs
(Grant AF-AFOSR-3485-78; AF Proj. 2308)
(AD-A071028; VPI-AERO-093; AFOSR-79-0769TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

Basic experimental studies of the injection of liquid fuel into a two dimensional flowfield designed to represent a sudden-expansion 'dump' combustor were performed under cold-flow conditions. Test conditions were as follows: 0.6 entrance Mach number, 25 PSIA total pressure, and nominally 75 F stagnation temperature. Two step heights were investigated, 1.0 in. in 0.5 in., corresponding to area ratios of 1.33 and 1.17. The investigation included Pitot and static pressure distributions, spark and streak shadowgraphs, surface flow visualization, direct photographs and videotape recordings. GRA

N79-32510# Michigan Univ., Ann Arbor. Dept. of Electrical and Computer Engineering.
THE PERFORMANCE OF A VECTORIZED 3-D NAVIER-STOKES CODE ON THE CRAY-2 COMPUTER Interim Report
J. S. Shang, P. G. Buning, W. L. Hankey, and M. C. Wirth Jul. 1979 11 p refs
(Grant AF-AFOSR-2812-75; AF Proj. 2304)
(AD-A071137; AFOSR-79-0790TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

A three-dimensional, time dependent Navier-Stokes code using MacCormack's explicit scheme has been vectorized for the CRAY-1 computer. Computations were performed for a turbulent, transonic, normal shock wave boundary layer interaction in a wind tunnel diffuser. The vectorized three-dimensional Navier-Stokes code on the CRAY-1 computer achieved a speed of 128 times that of the original scalar code processed by a CYBER 74 computer. The vectorized version of the code outperforms the scalar code on the CRAY computer by a factor of 8.13. A comparison between the experimental data and the numerical simulation is also made. GRA

N79-32511# Princeton Univ., N. J.
THE APPLICATION OF DIFFERENCE METHODS IN FLUID MECHANICS Final Report, 1972 - 1979
Sin-I Cheng Jun. 1979 18 p refs
(Contract N00014-75-C-0376)
(AD-A069544; Rept-1435) Avail: NTIS HC A02/MF A01 CSCL 20/4

This report outlines the objective and the progress made in achieving some understanding of the difference solutions of complex flow problems in fluid mechanics, which are inevitably computed at rather coarse meshes. We developed a set of difference algorithms, analyzed them as to the behavior of the 'errors' of the difference solutions of some model problems, and then applied them in the computational solution of the two dimensional interaction fields of a shock wave with a boundary layer, both for the laminar and for the turbulent cases with and without separation. The latest algorithm is developed specifically for computational solutions at coarse mesh attainable with a modest computer. We used mostly 1/4 capacity of the IBM 360-91 at Princeton University. It is shown how these solutions with comparable accuracy can be achieved with an order of magnitude reduction in computer time and capability when the new algorithm is used. GRA

N79-32512# Ecodynamics Research Associates, Inc., Albuquerque, N. Mex.
RAPID CALCULATION OF THREE-DIMENSIONAL FLOWS IN FLUSH INLETS Final Report
P. J. Roache Mar. 1979 10 p refs
(Contract N00014-76-C-0324)
(AD-A069585) Avail: NTIS HC A02/MF A01 CSCL 20/4

The development of semidirect methods for rapidly calculating steady-state viscous flows in channels is described. The methods successfully calculate laminar flows in almost arbitrary two dimensional channels, and also work successfully for turbulent flows. The methods are not successful in three dimensions. GRA

N79-32513# Ecodynamics Research Associates, Inc., Albuquerque, N. Mex.
USER'S MANUAL FOR CODES CHLG AND CHTS: STEADY INCOMPRESSIBLE VISCOUS FLOW IN TWO-DIMENSIONAL CHANNELS
Patrick J. Roache 31 Mar. 1979 10 p
(N00014-76-C-0324)
(AD-A069584) Avail: NTIS HC A02/MF A01 CSCL 20/4

This report is a user's manual for the two computer codes CHLG and CHTS for rapidly calculating steady incompressible viscous flow in two dimensional channels. Code CHLG calculates laminar flow only in a channel with a general shape for the lower boundary. Code CHTS includes both laminar and turbulent flow options, the latter by a simple eddy viscosity model, but is limited to straight wall channels. Both codes provide for either Couette or Poiseuille inflow, and use a symmetry condition at the top of the mesh. This manual will provide a description of input and output variables, plus key areas for possible modifications in the codes. GRA

N79-32514# Ecodynamics Research Associates, Inc., Albuquerque, N. Mex.
SEMIDIRECT METHODS FOR DISCRETIZED NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS, WITH PARTICULAR APPLICATIONS TO FLUID DYNAMICS Final Report, 1 Mar. 1976 - 28 Feb. 1979
Patrick J. Roache 15 May 1979 10 p refs
(Contract DAAG29-76-C-0018)
(AD-A069596; ARO-13599.6-MX) Avail: NTIS HC A02/MF A01 CSCL 20/4

Semidirect methods utilize direct (non-iterative) linear solvers to solve nonlinear problems in a non-time-like iteration. The semidirect methods are applied to various fluid dynamics problems. In each case, the direct linear solver used is some variation of a marching method. GRA

N79-32515# Oak Ridge National Lab., Tenn.
CONDENSATION OF REFRIGERANTS ON VERTICAL FLUTED TUBES
S. K. Combs, G. S. Mailen, and R. W. Murphy Aug. 1978 203 p refs
(Contract W-7405-eng-26)
(ORNL/TM-5848) Avail: NTIS HC A10/MF A01

Experiments were run to determine heat transfer performance of single vertical fluted tubes with selected fluids condensing on the outside. Working fluids included six fluorocarbons (Refrigerants 11, 21, 22, 113, 114, and 115) and a hydrocarbon (Refrigerant 600a or isobutane). The nine test tubes were of 2.54-cm nominal outside diameter and 1.2 m in length with from 0 (smooth) to 60 axial flutes. Condensing heat transfer coefficients ranged from 620 to 7900 W/sq m K over the heat flux range of 2000 to 43,000 W/sq m. All parameters are based on total condensing surface area. The data show that, for a given heat flux, a fluted tube can increase condensing coefficents up to 6.0 times smooth tube values. Further heat transfer enhancement was achieved by the use of drainage skirts on fluted tubes; these skirts effectively divided the 1.2-m tubes into two, four, and eight equal condensing lengths. DOE

N79-32516# Stanford Univ., Calif. Petroleum Research Inst.
TRANSIENT FLOW OF NON-NEWTONIAN POWER-LAW FLUIDS IN POROUS MEDIA Ph.D. Thesis
C. U. Ikoku and H. J. Ramey, Jr. Feb. 1979 271 p refs
(Contract EY-76-C-03-1265)
(SAN-1265-9; SU-SUPRI-TR-9) Avail: NTIS HC A12/MF A01

The basic characteristics of transient injection of a power-law non-Newtonian fluid were studied. A nonlinear partial differential equation for flow of power-law fluids was derived. The diffusivity equation is a special case of this equation. The partial differential equation describes the flow of a slightly compressible, non-Newtonian power-law fluid in a homogeneous and isotropic porous medium. This equation should govern the flow of most agents used in enchanced oil recovery projects. A linear form of the partial differential equation was also derived. A model for the flow of foam in porous media gave rise to another nonlinear partial differential equation which considers the compressibility of foam, and the pressure-dependent quality of foam. Analytical solutions of the transient and steady state forms of the linear partial differential equation were obtained. DOE

N79-32517# California Univ., Livermore. Lawrence Livermore Lab.
TIME-DEPENDENT FEM SOLUTION OF THE INCOMPRESSIBLE NAVIER-STOKES EQUATIONS IN TWO AND THREE DIMENSIONS
P. M. Gresho, R. L. Lee, R. L. Sani, and T. W. Stullich 7 Jul. 1978 59 p refs Presented at Conf. on Numerical Methods in Laminar and Turbulent Flow, Swansea, Wales, 17-21 Jul. 1978
(Contract W-7405-eng-48)
(UCRL-81323; Conf-780712-7) Avail: NTIS HC A04/MF A01

Future prospects regarding the numerical solution of the Navier-Stokes equations using the finite element method are discussed. Since the ultimate goal is to solve these equations in three dimensions, only the primitive variable (u,P) formulation is considered. A novel feature of the two dimensional solution technique relates to the methodology developed and employed for solving the semi-discretized system of ordinary differential equations, which are outlined in the section describing the development of the two dimensional code. Following the discussion of numerical results from two dimensional calculations, three dimensional flows are discussed, where several potentially viable options are considered. DOE

N79-32518# Los Alamos Scientific Lab., N. Mex.
CERAMIC HEAT PIPES FOR HIGH TEMPERATURE HEAT REMOVAL
E. S. Keddy and W. A. Ranken 1978 17 p refs Presented at the 18th Natl. Heat Transfer Conf. (AICHE-ASME), San Diego, Calif., 5-8 Aug. 1978
(Contract W-7405-ENG-36)
(LA-UR-79-332; Conf-7808101-1) Avail: NTIS HC A02/MF A01

A development program was initiated to demonstrate the technical and eventually the economical feasibility of ceramic heat pipts and ceramic heat pipe recuperators. The prime candidate for heat pipe construction is SiC. Closed-end tubes of this material were prepared by chemical vapor deposition (CVD). These tubes

were lined internally with tungsten by a subsequent CVD operation, partially filled with sodium, and sealed by brazing a tungsten lined SiC plug into the open end with a palladium-cobalt alloy. Heat pipes constructed in this manner were successfully operated in vacuum at temperatures of 1225 K and in air at a temperature of 1125 K. The heat source used initially for the air testing was an induction heated metallic sleeve in thermal contact with the test unit. Subsequent testing has shown that a silicon carbide heat pipe can be successfully operated with natural gas burners providing the input heat. Methods of fabricating and testing these devices are described. DOE

N79-32519# National Aerospace Lab., Amsterdam (Netherlands).
EUROPEAN RESEARCH PROGRAM ON VISCOUS FLOWS (EUROVISC) Annual Report
B. Vandenberg, ed., J. Cousteix, ed. (Centre d'Etudes et de Rech., Toulouse), T. K. Fanneloep, ed. (Aeron. Res. Inst. of Swed.), E. H. Hirschel, ed. (DFVLR, Cologne), and P. D. Smith, ed. (RAE, Bedford, Engl.) Oct. 1978 169 p refs
(NLR-MP-78033-U) Avail: NTIS HC A08/MF A01

Research activities on viscous flow problems in various countries in Europe are summarized. The research included is intended to be confined to viscous flow, which may be expected to lead to aeronautical applications. Comments on the research activities are given on the basis of the information given by the individual research workers. Besides these comments describing the various investigations in progress, comments of a general nature on a specific subject, viz. transition from laminar to turbulent flow are included. Author (ESA)

N79-32520# Centre National d'Etudes Spatiales, Toulouse (France). Centre Spatiale.
A COMPUTER METHOD FOR CALCULATING THE RADIATIVE INTERCHANGE FACTORS IN A COMPLEX ENCLOSURE AND AN EXTENSION OF THE METHOD TO THE CALCULATION OF THE INCIDENT FLUX DISTRIBUTION [CALMAR: LOGICIEL DE CALCUL DES COEFFICIENTS DE COUPLAGES RADIATIFS DANS UNE ENCEINTE QUELCONQUE EXTENSION AU CALCUL DE LA REPARTITION DE FLUX INCIDENTS]
Claude Quere Apr. 1979 98 p In FRENCH; ENGLISH summary
(CNES-NT-89) Avail: NTIS HC A05/MF A01

A method for computing radiative interchange factors in a complex enclosure with mixed diffuse or specular surfaces is described. The method simulates the physical phenonenon by tracking beams reflected within the enclosure. An extension of the method allows incident flux distribution on a structure to be calculated. The problem is first treated theoretically, then follows a detailed analysis of each step in the computer program. Input and output of the program, implemented on a CDC 7600, are also described. The applications of this calculation method to the simulation of satellite thermal behavior in orbit or to the analysis of the thermal conditions encountered in a space environment simulator are emphasized. Author (ESA)

N79-32521# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Sect. Construction Metallique.
DESIGNING TUBULAR HEAT EXCHANGERS USING AN INTERACTIVE COMPUTER PROGRAM
Rudy Beeckman May 1979 38 p refs Presented at Seminar on Machine Mech., Ghent Sponsored by Inst. pour l'Encouragement de la Rech. Sci. dans l'Ind. et l'Agr.
(CRIF-MT-131) Avail: NTIS HC A03/MF A01

An interactive computer program is proposed for the thermal design of tubular heat exchangers with either turbulent or streamline fluid characteristics. Although oriented towards the conversational use of the computer, which is easily achieved with minisystems, the program was written in standard FORTRAN 4 and this is largely independant of the type of machine used. Three main conditions are cited, the satisfaction of which is necessary to establishing the thermal rating of tube-and-shell heat exchangers. These are the need to provide sufficient heat transfer to meet the heat load requirements, the need to meet the pressure drop limitations of the shellside and tubeside fluids, and the need to comply with standard geometrical criteria, either general to all exchangers, or particular to a given unit. The types of exchangers considered, the mean temperature difference concept for mixed and for unmixed fluid, the pressure drop and convection coefficient correlations used for turbulent and for streamline flow, are discussed and a detailed program layout is given. Author (ESA)

N79-32522# National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.
HEAT BALANCE RESEARCH WITH A THIN-WALLED CUBE IN A SIMULATED SPACE ENVIRONMENT
A. A. M. Delil and J. F. Heemskerk 1 May 1978 48 p refs
(NLR-TR-78080-U) Avail: NTIS HC A03/MF A01

Heat balance research with a thin-walled cube was initiated to verify heat balance computer programs of the nodal network type. The heat balance experiments were carried out in a simulated space environment (inside a thermal-vacuum chamber with a liquid nitrogen cooled shroud, using a carbon arc solar simulator). The experimentally determined and the calculated temperature distributions agree very well when gas conduction inside the cube is included in the model. Supporting research to obtain input data for the heat balance experiments is described in the appendices. Included are an analytic solution for the heat balance of the cube, the measurement of the thermal conductivity of the cube wall material, the measurement of the thermal conductance of a rectangular bend in the wall material, the measurement of the thermal emissivity and solar absorptivity of the cube wall material, and a description of the calibration of the intensity distribution of the solar simulator beam.
Author (ESA)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N79-32523 British Broadcasting Corp., Kingswood (England). Research Dept.
DIGITAL RECORDING USING HOLOGRAM ARRAYS: OPTICAL DESIGN FOR AN EXPERIMENTAL 100 Mbit/s RECORDER
K. Hacking and J. L. Riley Aug. 1979 22 p refs
(BBC-RD-1979/14) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The general arrangements used in the construction of an experimental recorder are outlined and several optical design features of the proposed system are discussed in detail. These include the concepts underlying the design of a digit-beam array forming a hologram page and the optical methods for recovering the digital information. The optimum dimensions of the various optical components are derived from theoretical considerations based on the performance requirements. A brief description of an experimental record and replay apparatus intended for feasibility tests is given, together with some measurements of the optical transmission efficiencies achieved. Author

N79-32524 British Broadcasting Corp., Kingswood (England).
A MULTICHANNEL DIGITAL SOUND RECORDER
F. A. Bellis Aug. 1979 10 p refs
(BBC-RD-1979/15) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The design and construction of a 10-channel digital sound recorder using one-inch (25.4 mm) magnetic tape at about 20 inches/second (500 mm/s) are described. The requirements of the recorder are outlined, and the way is described in which head and tape capabilities are matched to the digital signal characteristics. An outline of the digital processing in the recorder is given, as is a summary of its performance. Possible future developments are indicated, and a resume of the recorder's usefulness in BBC Research Department is given. G.Y.

N79-32525 Lehigh Univ., Bethlehem, Pa.
LINEAR SWEEP DIFFERENTIAL PULSE VOLTAMMETRY: THEORY AND APPLICATION Ph.D. Thesis
KeriLyn Christine Burrows 1979 255 p
Avail: Univ. Microfilms Order No. 7919971

Linear sweep differential pulse voltammetry (LSDPV) is one of several variations on the technique of square wave voltammetry. A very shallow potential ramp creates a waveform effectively identical to that used in potential step differential pulse voltammetry. As the potential ramp becomes steeper, current contributions arising from the linear sweep nature of the waveform become more significant. A theoretical equation was derived for LSDPV which combines both the pulse nature and the sweep nature of the potential waveform. To a first approximation, results are in quite good agreement with experimental data obtained for both non/amalgamating and amalgamating reversible reductions at the hanging mercury drop electrode. Departures of experimental values from theoretical values are congruent with the lack of theoretical inclusion of nonfaradaic currents.
Dissert. Abstr.

N79-32526*# Benton Corp., Manor, Pa.
DESIGN FABRICATION AND INSTALLATION OF A YAW MEASURING DEVICE Final Report
30 Jun. 1979 53 p
(Contract NAS8-33209)
(NASA-CR-161300; Rept-210-1006) Avail: NTIS HC A04/MF A01 CSCL 14B

The results of work performed in the development and testing of a yaw measuring device are summarized. A review of the yaw measurement method; and the techniques and hardware needed for its implementation are presented. A description and summary of the tests performed at the U.S. Bureau of Mines Bruceton facility are included. Conclusions are summarized and recommendations for a unit capable of operation in a mine environment are presented. G.Y.

N79-32527# Aeronautical Research Labs., Melbourne (Australia).
LOW PASS FILTERING OF DATA RECORDED ON MAGNETIC TAPE IN FREQUENCY MODULATED FORM
K. F. Fraser Oct. 1978 24 p refs
(ARL-Mech-Eng-Note-373; AR-001-309) Avail: NTIS HC A02/MF A01

The demodulators described typically include low pass filters to recover signals from wideband frequency modulated carriers. Multispeed analogue tape machines normally require the carrier frequency to be set to a value proportional to tape speed. Reproducing hardware usually includes sets of filters, with bandwidth proportional to tape speed, for use with the demodulators. By dividing the frequency of the reproduced signal, a filter corresponding to a lower tape speed can be used and low pass filtering of recorded data signals can be readily achieved. However some unwanted noise components can be generated. These noise components are examined critically and a method of reducing them is demonstrated. M.M.M.

N79-32528# Naval Weapons Center, China Lake, Calif.
WAVELENGTH REPEATABILITY OF A CARY MODEL 14 R SPECTROPHOTOMETER
Marian E. Hills May 1979 20 p
(AD-A070704; NWC-TP-6109) Avail: NTIS HC A02/MF A01 CSCL 20/6

In our laboratory Cary spectrophotometers are used to measure the transmittance of optical components and materials. One instrument in particular, a Cary Model 14R spectrophotometer, is used to calibrate narrow-band interference filters. The precision of the wavelength measurements was determined using the D sub beta line of the deuterium source lamp as a wavelength standard. GRA

N79-32529# Jacobson (Donald M.) Language Services, Nashville, Tenn.
PCM TECHNIQUES AID IN STORING ANALOG DATA: AN EXACT MAGNETIC-TAPE STORAGE METHOD FOR ANALOG MEASUREMENT SIGNALS
H. P. Glockmann [1979] 14 p refs Transl. into ENGLISH from Elektron. Praxis, (West Germany), v. 8, no. 7-8, 1973 p 4
Sponsored by DOE Prepared for ONRL
(ORNL/TR-4573) Avail: NTIS HC A02/MF A01

The advantages of the pulse code modulation method for recording and storing signals which change continuously over time are discussed. The design of economical and operationally dependable pulse code modulation magnetic tape storage units through the application of integrated semiconductor component technology is addressed. J.M.S.

N79-32530# Los Alamos Scientific Lab., N. Mex.
EXPERIENCE WITH INSTALLATION AND OPERATION OF DIGITAL ELECTRONIC BALANCES
W. R. Severe, C. C. Thomas, Jr., and M. M. Stephens 1979 8 p refs Presented at 1st Ann. Symp. on Safeguards and Nucl. Mater. Management, Brussels, 25 Apr. 1979
(Contract W-7405-eng-36)
(LA-UR-79-1029; Conf-790430-7) Avail: NTIS HC A02/MF A01

Los Alamos Scientific Laboratory is implementing a near real time nuclear material control program. Digital electronic balances interfaced directly to a central computer are an important part of this program. Weighing errors are characterized and several methods of installation are discussed in terms of the impact on measurement errors. DOE

N79-32531# Leybold-Hochvakuum-Anlagen G.m.b.H., Cologne (West Germany). Vacuum Components and Standard Systems Div.
MANOMETERS FOR EXTREMELY LOW PRESSURE Final Report
Guenter Reich Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 93 p refs In GERMAN; ENGLISH summary
(Contract BMFT-NT-0051)
(BMFT-FB-T-78-38) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 19,35

Research and development work was done in the field of very low pressure measurements in order to better define low pressure phenomena and to test, improve, or develop measuring equipment and techniques. The potential of modern electronic components used in vacuum gage control units were investigated. An extractor ionization vacuum gage head and gage control unit for the total pressure range between 1/10,000 and 1/10 trillion torr were tried. High stability ion sources designed on the extractor principle for partial pressure gages were studied. A high sensitivity magnetic sector mass spectrometer with z-focusing was tested and a quadrupole mass spectrometer with a control unit for the mass range up to 200 for measurement of partial pressure down to 1/10 trillion torr was developed.
Author (ESA)

N79-32532# Bonn Univ. (West Germany). Physikalisches Inst.
A PHOTOCONDUCTIVE DETECTOR FOR THE MIDDLE INFRARED Final Report
Klaus Ulrich Grossmann, Ursula Hirt, and Dirk Offermann Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 43 p refs In GERMAN; ENGLISH summary
(Contract BMFT-WRT-1075; DFVLR-BPT-01-00-015-A)
(BMFT-FB-W-78-32) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 8,80

Fabrication and tests of various copper doped germanium photoconductors are described. In addition to the expected response of these detectors at wavelengths below about 30 micrometers due to the copper doping, most of the tested detectors exhibit a high sensitivity at wavelengths up to 200 micrometers. These results were used to obtain a broadband photoconductive detector the sensitivity of which shown to extend from approximately 5 micrometers to 200 micrometers.
Author (ESA)

N79-32533# National Physical Lab., Teddington (England). Div. of Mechanical and Optical Metrology.
A REVIEW OF THE FUNDAMENTAL METHODS USED FOR MEASURING GAGE PRESSURES UP TO 1 kPa
G. N. Peggs Oct. 1978 39 p refs
(NPL-MOM-34) Avail: NTIS HC A03/MF A01

The accurate measurement of gage pressures up to about

1 kPa has important applications, especially in the field of aircraft instrumentation. The use of a number of primary standard instruments, with an uncertainty of measurement of about + or - 0.1 Pa, is described. These instruments are reviewed and detailed estimates of their uncertainties made. A brief outline of the procedures employed for the calibration of other instruments is also given. Author (ESA)

N79-32534# Royal Aircraft Establishment, Farnborough (England).
THE DESIGN OF AN ERROR DETECTION AND CORRECTION SYSTEM FOR USE WITH SINGLE TRACK AIRBORNE DIGITAL MAGNETIC RECORDING SYSTEMS
C. W. Jackson London Apr. 1978 59 p refs
(RAE-TM-IT-171; BR64334) Avail: NTIS HC A04/MF A01

The types of error that can occur in airborne digital magnetic recording systems are described, and the problems associated with the correction of these errors on medium and high packing density single track systems are discussed. Some methods whereby record/replay errors on single track systems may be detected and corrected are explained and a description is given of a system using these principles. Sufficient design work was completed to show that the system is a practical one to construct. Author (ESA)

N79-32535# Merck (E.), Darmstadt (West Germany). Chemische Forschung und Entwicklung.
NEMATIC LIQUID CRYSTALS FOR DISPLAY SYSTEMS Final Report
Rudolf Eidenschink, Joachim Krause, and Ludwig Pohl Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 27 p In GERMAN; ENGLISH summary
(Contract BMFT-NT-637)
(BMFT-FB-T-78-41) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 5,50

Liquid crystals suitable for use in flat display devices working on the principle of either a dynamic scattering mode, the twisted nematic cell, the DAP effect, or a cholesteric-nematic phase transition were developed and studied. Nematic single substances were synthesized and liquid crystalline mixtures composed in response to the requirements of display device manufactures. Two classes of substances suitable for electro-optic purposes were found. One nematic phase for dynamic scattering, five phases for the twisted nematic cell, several test mixtures for multiplexing, and one phase for the cholesterol-nematic phase transition were developed. Furthermore, several azo dyes suitable for liquid crystal color switches were synthesized. Author (ESA)

36 LASERS AND MASERS

Includes parametric amplifiers.

N79-32536 Rice Univ., Houston, Tex.
STUDY OF VOLUME PHASE HOLOGRAM RECORDING IN Fe:LiNbO3 USING OPTICAL PULSES, PART 1. INVESTIGATION OF ABSORPTION AND GAIN OF LASER DYES WITH PICOSECOND PUMPING, PART 2 Ph.D. Thesis
Che-Tsung Chen 1979 107 p
Avail: Univ. Microfilms Order No. 7919571

A Q-switched frequency doubled Nd:YAG laser was used to record holograms in Fe:LiNbO3. A distinct intensity enhanced photorefractive effect was found. For 1% diffraction efficiency only 50 mJ/sq cm was needed as compared to 500 mJ/sq cm for CW recording. Induced absorption was observed during hologram recording. The correlation between this induced absorption and the enhanced recording sensitivity is discussed. The data is interpreted in terms of secondary photorefractive centers within the framework of bulk photovoltaic model. Using a passively mode-locked Nd:YAG laser, the absorption and gain of oxazine 1 and 9 were examined. Picosecond pumping is shown to have better gain efficiency and wavelength tunability than nanosecond pumping. Dissert. Abstr.

N79-32537 Polytechnic Inst. of New York.
TWO-PHOTON CORRELATIONS IN AMPLIFIED LASER LIGHT Ph.D. Thesis
Gary Donald Blake 1979 75 p
Avail: Univ. Microfilms Order No. 7920769

The difference in the time of detection between single photon pairs was measured for single mode helium-neon laser light amplified by a helium-neon discharge well below saturation. Two-photon time distributions were measured for ratios of amplified laser intensity to discharge tube spontaneous emission intensity of .5, 1, and 2. Enough experimental parameters were known to compare unambiguously the results with the predictions of quantum field theory. The measured time distributions show no deviations from the distributions predicted for a simple mixture of laser and chaotic light, confirming that the stimulated emission coherently amplifies laser light with no change in the second order photon statistics. No additional counting rate which could be directly attributed to time correlations between stimulated and stimulating photons in the discharge amplifier were detected. Dissert. Abstr.

N79-32538*# Rockwell International Corp., Anaheim, Calif.
HIGH POWER PHASE LOCKED LASER OSCILLATORS Final Report
C. L. Hayes, C. L. Telk, J. Soohoo, and W. C. Davis May 1979 103 p refs
(Contract NAS3-20376)
(NASA-CR-159630; C76-1555/501) Avail: NTIS HC A06/MF A01 CSCL 20E

The feasibility of mechanizing an adaptive array of independent laser oscillators for generation of a high power coherent output was experimentally investigated. Tests were structured to evaluate component/system requirements for delivery of energy to a low-earth orbit satellite. Initial experiments addressed the control issues of phase locking unstable resonators at low power levels. A successful phase lock demonstration formed the basis for the design and fabrication of the high power, water-cooled, control mirror subsequently installed in the NASA LeRC high power laser. Tests were performed to characterize the operational limits of the laser system and included quantitative assessment of the frequency stability, noise sources, and optical properties of the beam. Author

N79-32539*# Miami Univ., Oxford, Ohio. Dept. of Physics.
NUCLEAR-PUMPED LASERS 2 Final Report, 1 Mar. 1977 - 31 Aug. 1979
William Wells and Russell DeYoung 1979 33 p refs
(Grant NsG-1396)
(NASA-CR-162320) Avail: NTIS HC A03/MF A01 CSCL 20E

The two main research objectives of the contract were to demonstrate high power nuclear lasering (similar to kWatt) and demonstrate nuclear pumping with fission fragments from (U-235)F6. The progress made towards these objectives is discussed. G.Y.

N79-32540*# Laser Development Corp., Lexington, Mass.
DEVELOPMENT OF TUNABLE HIGH PRESSURE CO2 LASER FOR LIDAR MEASUREMENTS OF POLLUTANTS AND WIND VELOCITIES, JANUARY 1976 TO DECEMBER 1977 Final Report, Jan. 1976 - Dec. 1977
Ali Javan Washington NASA Sep. 1979 27 p
(Contract NAS1-14289)
(NASA-CR-3175) Avail: NTIS HC A03/MF A01 CSCL 20E

A tunable multiatmospheric pulsed CO2 laser with emphasis on experimental features and supporting theoretical analyses important to differential absorption lidar and Doppler lidar measurement of pollutants and wind velocities is reported. The energy deposition and the means to produce the uniform high density plasma in the multiatmospheric medium, through UV preionization of an organic seed gas is discussed. Design features of the pulsed CO2 laser are presented. The radiative processes which are operative and prevent the laser from breaking into oscillations in a large number of modes over its broad amplification bandwidth are described. The mode competition for the transient pulsed laser oscillation in a standing wave and traveling wave ring laser configuration is discussed and contrasted with the approach to steady state oscillations. The latter findings are important to transient injection locking for production of a highly stable pulsed CO2 laser output. A.W.H.

N79-32541# Electronics Research Lab., Adelaide (Australia).
ION BOMBARDMENT OF MATERIALS CONTAINING ALKALI METALS OF ALKALINE EARTHS
E. H. Hirsch and T. R. Adams 12 Dec. 1978 28 p refs
(AD-A070284; ERL-0053-TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

Experiments show that argon ion bombardment of many substances results in the chemical sensitization of the irradiated surface. As a consequence, subsequent exposure to atmospheric water vapor causes evolution of hydrogen, and in certain cases leads to severe surface corrosion. The effect occurs on targets containing elements from the first and second column of the periodic table, and therefore includes some widely used electro-optical materials. A mechanism is proposed to explain the observed phenomena, and the possibility of ion polishing sensitive materials is discussed. GRA

N79-32542# Harry Diamond Labs., Adelphi, Md.
POSSIBLE USE OF TWO LASER BEAMS TO DETERMINE PARTICLE-SIZE DISTRIBUTION
Donald E. Wortman Jan. 1979 49 p refs Sponsored by the Army
(AD-A070965; HDL-TR-1978) Avail: NTIS HC A03/MF A01 CSCL 20/6

A study was made to determine whether particle-size distributions for small diameter aerosols (radius - or + 20 microns) such as fog can be determined by a new technique based on resonantly distorting the liquid drops by an oscillating electric field at the drops' mechanical vibrational frequencies. This field was transmitted by a linearly polarized CO2 laser of intensity 100 W/sq. cm. amplitude modulated at frequencies between 40,000 and 3,000,000 Hz, which correspond to the fundamental vibration frequencies of drops varying in radius from 21.2 to 1.19 microns. An unmodulated, 2-mW He-Ne laser was beamed along the path of the CO2 radiation, and scattering of this light was observed. The intensity of the He-Ne light scattered from the drops at the resonance frequency should be proportional to the density of the drops in the fog that oscillate at that frequency. A sensitive detection system able to measure ac signals with intensities as low as 10 to the -17th power W collected the scattered He-Ne light. GRA

N79-32543# Owens-Illinois, Inc., Toledo, Ohio.
INVESTIGATION OF BROAD-BAND EMITTERS AS POTENTIAL LASING IONS BETWEEN 0.5 AND 1.0 MICROMETERS Final Report, 1 Jun. 1976 - 30 Sep. 1978
Charles F. Rapp, Norman L. Boling, and Cloyce M. Carlen 2 Apr. 1979 78 p
(Contract F44620-76-C-0088; AF Proj. 2301)
(AD-A070971; AFOSR-79-0736TR) Avail: NTIS HC A05/MF A01 CSCL 20/5

Ions exhibiting broad fluorescence bands in the 5000A to 10,000A region have been studied as potential lasing ions in various glass hosts. Included in the study were Eu(2+), Cu(+), Sn(2+), Sb(2+), Yb(2+), Ge(2+), and CdS. Glass hosts included silicates, borates, and phosphates. Spectral data were used to calculate peak emission cross sections and flashlamp pumping thresholds for various ion-host combinations. These data indicated that Eu(2+) should lase easily. Cu(+), Sn(2+), and Sb(2+) should also lase but would require significantly greater pumping energies. Gain (loss) measurements were made on selected glass rods by passing a CW laser beam through the rods during flashlamp pumping. No gain was measured. Instead, most rods showed a pumped absorption. This absorption was probably due to transient color center formation in the glass hosts themselves, rather than excited state absorption by the dopant ions. Flashlamp pumping studies of several of the ions in various hosts selected for low pumped absorption is recommended as further work. Also recommended is laser pumping, which would eliminate the shorter wavelength ultraviolet primarily responsible for color center formation. GRA

N79-32544# R and D Associates, Marina Del Rey, Calif.
INVERSE BREMSSTRAHLUNG ABSORPTION RATE IN AN INTENSE LASER FIELD
L. Schlessinger and Jon Wright Nov. 1978 41 p refs
(Contract W-7405-eng-48)
(UCRL-13965; RDA-TR-108600-001) Avail: NTIS HC A03/MF A01

A model was provided for the bremsstrahlung process applicable over the whole range of interest for use in LASNEX. The derivation of the bremsstrahlung cross section and various approximate forms useful in the numerical calculations, and deviation of the expression for the energy absorption rate for a general distribution function and special forms for various approximations to the cross section are presented. The alternative methods of derivation of the energy absorption rate are discussed. Numerical results are presented along with comparison among the different expressions, and the validity of the assumptions and methods to relax the approximations are discussed. DOE

N79-32545# California Univ., Berkeley. Lawrence Berkeley Lab.
PEP LASER SURVEYING SYSTEM
T. Lauritzen and R. C. Sah Mar. 1979 7 p ref Presented at the IEEE Particle Accelerator Conf., San Francisco, 12 Mar. 1979
(Contract W-7405-eng-48)
(LBL-8412; Conf-790327-147) Avail: NTIS HC A02/MF A01

A Laser Surveying System was developed to survey the beam elements of the PEP storage ring. This system provides automatic data acquisition and analysis in order to increase survey speed and to minimize operator error. Two special instruments, the Automatic Readout Micrometer and the Small Automatic Micrometer, were built for measuring the locations of fiducial points on beam elements with respect to the light beam from a laser. These instruments automatically encode offset distances and read them into the memory of an on-line computer. Distances along the beam line are automatically encoded with a third instrument, the Automatic Readout Tape Unit. When measurements of several beam elements are taken, the on-line computer analyzes the measured data, compared with desired parameters, and calculates the required adjustments to beam element support stands. DOE

N79-32546# Honeywell Corporate Material Sciences Center, Bloomington, Minn.
DEVELOPMENT OF FLUORIDES FOR HIGH POWER LASER OPTICS Quarterly Technical Progress Report, 1 Jan. - 31 Mar. 1979
J. F. Ready and H. Vora Apr. 1979 6 p refs
(Contract ET-78-C-08-1555)
(NVO-1555-4) Avail: NTIS HC A02/MF A01

Continued development of LiF as a material with low nonlinear refractive index and high ultraviolet transmission as a material for use in the laser fusion program is summarized. LiF single crystals are forged under isostatic helium constraint to form fine-grained window blanks. Results on multistep forging of LiF to increase the percentage reduction that can be imparted to the starting material are presented. It also describes calorimetric measurement of the absorption coefficient of LiF at 1.06 microns. The first attempts to forge KTb3F10, a Faraday rotator material, are discussed. DOE

N79-32547# National Technical Information Service, Springfield, Va.
RADIATION DAMAGE OF LASER MATERIALS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - May 1979
Brian Carrigan Jun. 1979 213 p Supersedes NTIS/PS-78/0516; NTIS/PS-77/0435; NTIS/PS-76/0383; NTIS/PS-75/399; COM-73-11713
(NTIS/PS-79/0514/4; NTIS/PS-78/0516; NTIS/PS-77/0435; NTIS/PS-76/0383; NTIS/PS-75/399; COM-73-11713) Avail: NTIS HC $28.00/MF $28.00 CSCL 20E

Laser beam damage to laser materials such as optical glass, glass fibers, alkali metal halides, metals, mirrors, optical coatings, dielectrics, semiconductors, and matrix materials was studied. The majority of these citations concern infrared laser damage to infrared optical materials. (This updated bibliography contains 207 abstracts, 24 of which are new entries to the previous edition.) GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N79-32548 Akron Univ., Ohio.
A MATHEMATICAL ANALYSIS OF THE ROTARY PIERCING PROCESS Ph.D. Thesis
Harry Zantopulos 1979 343 p
Avail: Univ. Microfilms Order No. 7919418

A combined experimental/numerical study of the rotating piercing process was performed to investigate the premature cavitation/rupture phenomenon that can occur. In the experimental phase, sections of partially pierced billets were examined to ascertain the void growth and coalescence taking place. The billets were actually pierced in an industrial piercing mill under severe operating conditions to enhance the occurrence of premature cavitation. In addition, hot tensile tests were run at 2200 F to help establish the material properties. The analytical phase consisted of the simulation of the rupture process through the use of a systematic finite element modelling employing large strain plasticity theory. Therefore, the approach adopted was to finite element model the rotary compression test. This test produces a stress system and associated internal rupture similar to that existing in the entry zone of the rotary piercer.
Dissert. Abstr.

N79-32549 Texas A&M Univ., College Station.
DYNAMIC RESPONSE OF A ROTATING, BALANCED, FLEXIBLE SHAFT SUPPORTED BY A THERMODYNAMIC BEARING SYSTEM Ph.D. Thesis
Morris Michael Stroman 1979 166 p
Avail: Univ. Microfilms Order No. 7919111

A method is presented which allows the simulation of the transient and steady state response of a balanced, flexible shaft supported by a realistic thermohydrodynamic journal bearing system. The analytical model is an accurate presentation of the real shaft-bearing system and includes the following features: (1) large deflections of the shaft up to the proportional limit of the material; (2) gravity and all inertial loadings (including gyroscopic effects) arising from the general three dimensional motion of the shaft; (3) pressure-dependent viscous effects of the incompressible lubricant; (4) wedge and squeeze film effects of the lubricant due to general journal motion (six degrees of freedom); (5) exact computation of the film thickness of the lubricant for any given position and orientation of the journal; and (6) a novel approach to the calculation of the hydrodynamic loads acting on a journal for general journal motion.
Dissert. Abstr.

N79-32550 Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Luft und- Raumfahrttechnik.
APPLICATION OF VARIOUS THEORIES TO KINEMATIC SHIMMY STUDIES [DER KINEMATISCHE SHIMMY AUS DER SICHT VERSCHIEDENER THEORIEN]
Ekkehard Sperling 1977 27 p ref In GERMAN
(TUM-MW-14-7701) Avail: Issuing Activity

Previous studies on kinematics and the kinetics of elastic wheels are continued. The stability of a slowly rolling wheel, with an axle, and with only gamma degrees of rotational freedom is investigated using a number of different theories. The results obtained are given and then used to derive an exhaustive mathematical model of the effect of shimmy on the system.
Author (ESA)

N79-32551*# Avco Lycoming Div., Stratford, Conn.
DEVELOPMENT OF SPIRAL-GROOVE SELF-ACTING SEALS FOR HELICOPTER ENGINES Final Report, 10 Jun. 1977 - 31 Dec. 1978
Michael OBrien Jun. 1979 62 p Sponsored in part by Army Res. and Technol. Labs.
(Contract NAS3-20795)
(NASA-CR-159622; LYC-79-25) Avail: NTIS HC A04/MF A01 CSCL 11A

A spiral-groove, self-acting face seal was rig tested at advanced gas turbine operating conditions to determine wear and leakage rates. The spiral-groove, self-acting geometry was located in the rotating seal seat. Seal component wear induced by start-stop operation was measured after subjecting the test seal to 176 start-stop cycles. Wear occurring during normal operation was documented throughout a 75-hour endurance test. Seal air leakage was also measured. During endurance operation, the seal was subjected to operating conditions bounded by the values surface speed - 244 m/s (800 ft/sec), air pressure - 148 N/sq cm abs (215 psia), and air temperature - 622 K (660 F). The post-test condition of the seal components was documented. Wear data is presented in tabular form, while seal air leakage is presented graphically, as a function of pressure and speed.
F.O.S.

N79-32552*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF PREDICTED AND MEASURED ELASTOHYDRODYNAMIC FILM THICKNESS IN A 20-MILLIMETER-BORE BALL BEARING
John J. Coy, Rama S. R. Gorla (Cleveland State Univ., Ohio), and Dennis P. Townsend Oct. 1979 29 p refs
(NASA-TP-1542; AVRADCOM-TR-79-20; E-9992) Avail: NTIS HC A03/MF A01 CSCL 13I

Elastohydrodynamic film thicknesses were measured for a 20-mm bore ball bearing using the capacitance technique. The bearing was thrust loaded to 90, 445, and 778 N (20, 100, and 175 lb). The corresponding maximum contact stress on the inner race was 1.28, 2.09, and 2.45 GPa (185 000, 303,000, and 356, 000 psi). Test speeds ranged from 400 to 15,000 rpm. Measurements were taken with four different lubricants: (1) synthetic paraffinic; (2) synthetic paraffinic with additives; (3) synthetic type II aircraft oil; and (4) synthetic cycloaliphatic hydrocarbon traction fluid. The test bearing was mist lubricated. Test temperatures were 27, 65, and 121 C (80, 150, and 250 F). The measured results for the various test parameters were compared to theoretical predictions from computer programs. Also the data were plotted on dimensionless coordinates and compared to several classical isothermal theories.
Author

N79-32553# Pratt and Whitney Aircraft, West Palm Beach, Fla. Government Products Div.
SURVIVABILITY OF SILICON NITRIDE BEARING Final Report, 1 Aug. 1977 - 1 Dec. 1978
W. Grace Dec. 1978 51 p refs
(Contract N00140-77-C-0974)
(AD-A070383; PWA-FR-11012) Avail: NTIS HC A04/MF A01 CSCL 13/9

An oil shutoff test was conducted on a 35 mm bearing with silicon nitride balls. The time to bearing failure was 90 sec compared to 45 sec for an M-50 steel bearing which was similarly tested. This result which compares favorably with the 1.74 factor was predicted by an analytical model. Post-test inspection found the silicon nitride balls with minor surface distress compared to the extreme spalling of the M-50 balls.
GRA

N79-32554# DCW Industries, Studio City, Calif.
DEVELOPMENT OF A VISCOUS THEORY OF THREE-DIMENSIONAL FLOW IN HIGHLY-LOADED AXIAL TURBOMACHINES Interim Scientific Report, 31 Mar. 1978 - 31 Mar. 1979
David C. Wilcox Jun. 1979 31 p refs
(Contract F49620-78-C-0024; AF Proj. 2037)
(AD-A071049; DCW-R-21-01; AFOSR-79-0804TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

A computer program is being developed which will be suitable for numerically simulating three-dimensional viscous flow in rotating turbomachines. This report summarizes progress to date and gives projections of work to be accomplished during the next year.
GRA

N79-32555# Oak Ridge National Lab., Tenn.
FREQUENCY ANALYSIS OF A THICK-RIM FLYWHEEL
D. N. Fanning Sep. 1978 50 p refs
(Contract W-7405-eng-26)
(ORNL/TM-5804) Avail: NTIS HC A03/MF A01

The calculation of natural frequencies of a thick rim flywheel is presented using two analysis methods: the finite element method and the transfer matrix method. A listing of the computer program developed using the transfer matrix method is included.

The results of the finite element analysis indicate that the computer programs NONSAP and ADINA are incapable of determining out-of-plane natural frequencies of the flywheel. The results of the analysis using the transfer matrix method are satisfactory for out-of-plane as well as in-plane frequencies. DOE

N79-32556# Institut fuer Angewandte Materialforschung der Fraunhoffer-Gesellschaft e. V., Bremen (West Germany).
ON THE WELDING OF MARTENSITIC HARDENED STEELS [ERFAHRUNGEN BEIM SCHWEISSEN EINES MARTENSIT-AUSHAERTBAREN STAHLS]
S. Klingauf and K. Seifert Bonn DOKZENTBW 1978 90 p refs In GERMAN Sponsored by Bundesmin. der Verteidung (BMVG-FBWT-78-17) Avail: NTIS HC A05/MF A01

A good understanding of the weldability and weld characteristics of a high strength maraging steel X2 nickel-cobalt-molybdenum (HFX 750) was sought. Studies were performed on transformation and precipitation processes, and variations in the physical constants (yield point, tensile strength) of alloys with different titanium contents. Results obtained with various welding procedures (TIG, MIG, electron beam welding) are presented. The physical characteristics studied include strength, resistance, temperature fields, and cracking. Curves and metallographic photographs are given. Author (ESA)

N79-32557# National Physical Lab., Teddington (England). Div. of Mechanical and Optical Metrology.
A NEW METHOD FOR THE MEASUREMENT OF ROCKWELL DIAMOND INDENTERS
P. J. Nash Oct. 1978 36 p refs
(NPL-MOM-33) Avail: NTIS HC A03/MF A01

An instrument was designed to yield measurements showing the effective radius, departure from a given radius, and the position of the radius with respect to the conical flanks of the Rockwell C scale indenter. The surface of the indenter tip was located by means of a microscope fitted with a Michelson interference objective. White light illumination was used so that the fringes obtained between the reference plane and the convex indenter surface could be indentified by their color. The zero order fringe could then be used as a fiducial setting, by moving the microscope until the fringe was at the center of the bull's eye interference pattern. Some idea of the shape of the indenters could be gained from the fringe pattern. On the spherical cap, good indenters showed reasonable even bulls eye' patterns of concentric rings, while others had irregularly shaped fringes. For a perfect indenter, the flank setting should show the zero order fringe as a straight line, with the other, colored fringes symmetrically disposed on either side. A.R.H.

N79-32230*# Hampshire Coll., Amherst, Mass. Dept. of Physics.
MASS DRIVERS. 1: ELECTRICAL DESIGN
William Arnold, Stuart Bowen, Kevin Fine (MIT), David Kaplan (Michigan Univ.), Margaret Kolm (Haverford Coll.), Henry Kolm (MIT), Jonathan Newman (Amherst Coll.), Gerard K. ONeill (Princeton Univ.), and William Snow (MIT) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 87-100 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 13I

N79-32231*# Hampshire Coll., Amherst, Mass. Dept. of Physics.
MASS DRIVERS. 2: STRUCTURAL DYNAMICS
William Arnold, Stuart Bowen, Kevin Fine (MIT), David Kaplan (Michigan Univ.), Margaret Kolm (Haverford Coll.), Henry Kolm (MIT), Jonathan Newman (Amherst Coll.), Gerard K. ONeill (Princeton Univ.), and William Snow (MIT) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 101-118 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 13I

N79-32232*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MASS DRIVERS. 3: ENGINEERING
William Arnold (Hampshire Coll.), Stuart Bowen, Steve Cohen, Kevin Fine (MIT), David Kaplan (Michigan Univ.), Margaret Kolm (Haverford Coll.), Henry Kolm (MIT), Jonathan Newman (Amherst Coll.), Gerard K. ONeill (Princeton Univ.), and William Snow (MIT) *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 119-157 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 13I

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N79-32558 Pennsylvania Univ., Philadelphia.
THEORETICAL AND COMPUTATIONAL ASPECTS OF RELIABILITY INDICES FOR LARGE SCALE SYSTEMS Ph.D. Thesis
Julia Victoria Bukowski 1979 229 p
Avail: Univ. Microfilms Order No. 7919434

Elements of reliability analysis for large scale, multiterminal systems with repairable components were investigated. With the systems modelled as Markov processes, Markov theory and aspects of the state space structure were utilized in developing new methods of reliability evaluation. Attention was focused on the reliability indices of availability and expected frequency and duration of service interruption. A new formulation of the frequency index was derived which is based on an implicit evaluation of the system states. It was demonstrated that in the process of implicit state classification, the state space assumes a hierarchical, tree-like structure determined by well defined ordering relations. By exploiting the properties of this structure, an efficient algorithm for computing the system and service point reliability indices was produced and applied to an electric power system.
Dissert. Abstr.

N79-32559# Rome Air Development Center, Griffiss AFB, N.Y.
APPLICATION OF BAYESIAN TECHNIQUES TO RELIABILITY DEMONSTRATION, ESTIMATION AND UPDATING OF THE PRIOR DISTRIBUTION Technical Report, Jun. - Aug. 1978
Theodore S. Bolis Apr. 1979 31 p refs
(AF Proj. 2338)
(AD-A070236; RADC-TR-79-121) Avail: NTIS HC A03/MF A01 CSCL 12/1

A method is presented for the estimation of the shape and scale parameters of an inverted gamma prior distribution of the mean-time-to-failure for equipment having exponential time-to-failure distribution. This method, akin to the Maximum Likelihood Method, allows the use of all sorts of existing failure data on the equipment in question, provided a certain sufficient condition is satisfied. Further, this method (we call it the Generalized Maximum Likelihood Method) is usable to update the prior distribution, when new failure data become available. In the long run, this updating process will give rise to a solid prior, which can confidently be used in Reliability Demonstration. Various facets of the sufficient condition for the applicability of this estimation method are exposed, the variance--covariance matrix of the estimators is given under various randomness assumptions and some numerical considerations are discussed. There is a brief discussion of alternate estimators in the case of a truncated test data. Author (GRA)

N79-32560# Battelle Columbus Labs., Ohio.
MULTIFREQUENCY EDDY CURRENT INSPECTION FOR CRACKS UNDER FASTENERS, PHASE 2 Final Technical Report, Apr. 1977 - Nov. 1978
G. H. Wilson, D. T. Hayford, and R. P. Meister Mar. 1979 72 p
(Contract F33615-76-C-5062; AF Proj. 7351)
(AD-A071102; AFML-TR-79-4023) Avail: NTIS HC A04/MF A01 CSCL 14/2

This report describes the second phase of a two-phase program. Phase I, reported in TR-76-209, was directed toward the evaluation and demonstration of multiple frequency eddy-current (MFEC) using wing-splice samples and laboratory instrumentation to detect cracks under titanium and steel fasteners. This Phase II report covers the development evaluation of a

prototype MFEC system for field use. The system was built around commercially available micro-computer modules coupled with in-house designed eddy current electronics, an eddy current probe, and a multifunction operator control panel. The system was 'trained' using two C-5A wing panel sections having sawcuts to simulate cracks. Tenth-inch sawcuts at the top of the second layer could be repeatedly detected using a decision algorithm based on a combination of four frequencies. The prototype system was evaluated during July, 1978, as part of the C-5A Structural Evaluation and Inspection Program (SEIP). Of approximately 400 fasteners inspected with the system, one suspect was found and later confirmed with another NDE method. In continued development of the MFEC technique, methods must be investigated which will be tolerant of variations in geometry found around rib stiffeners and single fastener rows. GRA

N79-32561# Army Tropic Test Center APO, Miami 34004.
METHODOLOGY INVESTIGATION. MOISTURE AND TEMPERATURE CONDITIONS IN STORAGE CONTAINERS IN HUMID ENVIRONMENTS Final Report, Feb. 1976 - Feb. 1977
Wilfried H. Portig Dec. 1978 82 p refs
(AD-A071134; USATTC-78090) Avail: NTIS HC A05/MF A01 CSCL 15/5

A methodology investigation was initiated by the USATTC in the Canal Zone in February 1976 to provide a further understanding of the basic processes that lead to water damage of material in storage containers, and to enhance knowledge of thermal buildup on surfaces and in the air inside storage containers. The investigation revealed that moisture conditions inside storage containers were influenced significantly by the materials inside those containers. With increasing temperature, the materials were found to rapidly release moisture to the container air significantly changing the moisture content (absolute humidity) of the air and increasing the potential for water condensation when radiation cooling of the contents and walls of the container occurred. To reduce the occurrence of water damage in storage containers, the study recommends that the amount of water initially enclosed in a container be minimized by (1) pre-drying the goods to be stored, (2) pre-drying the materials (e.g., pallets and packaging material) associated with the storing of goods and (3) closing the container in dry ambient environment. Further study of the basics of moisture migration within storage containers is also recommended. GRA

N79-32562# Stanford Univ., Calif. Edward L. Ginzton Lab.
HIGHLY EFFICIENT TRANSDUCER ARRAYS USEFUL IN NONDESTRUCTIVE TESTING APPLICATIONS
C. S. DeSilets, A. R. Selfridge, and G. S. Kino Sep. 1978 7 p refs
(Contract N00014-75-C-0632)
(AD-A070725; SU-GL-2866) Avail: NTIS HC A02/MF A01 CSCL 20/1

The development of two types of transducer arrays for use in a synthetic aperture digital acoustic imaging system is described in this paper. One type of array using narrow slotted piezoelectric elements is most suitable when the acoustic impedance of the load medium is low with respect to that of the piezoelectric ceramic. A second type of array of monolithic construction is useful when the acoustic impedance of the load medium is similar to that of the ceramic, as would be useful for a contracting transducer for nondestructive testing of metals and ceramics. GRA

N79-32563# Rockwell International Science Center, Thousand Oaks, Calif.
PROCEEDINGS OF THE ARPA/AFML REVIEW OF PROGRESS IN QUANTITATIVE NONDESTRUCTIVE EVALUATION Annual Report, 1 Jul. 1977 - 30 Jun. 1978
Donald O. Thompson Jan. 1979 545 p refs
(Contract F33615-74-C-5180; AF Proj. 7351)
(AD-A071047; SC595.51AR; AFML-TR-78-205; Rept-4) Avail: NTIS HC A23/MF A01 CSCL 14/2

The edited transcripts of the ARPA/AFML Review of Quantitative Nondestructive Evaluation (NDE) held on July 17-21, 1978, at Scripps Institution of Oceanography, La Jolla, California, are presented in this document. Several key topics form the core of these presentations and discussions. They include quantitative ultrasonics, adhesives and composites, emissions related to failure prediction, residual stress, and reliability of ceramics. It is believed that this document provides a reasonable summary of NDE research and development currently underway. GRA

N79-32564# Daedalean Associates, Inc., Woodbine, Md.
PRELIMINARY TESTING RESULTS FOR THE APPLICATION OF A NONDESTRUCTIVE EVALUATION TECHNIQUE UTILIZING THE PHENOMENON OF INTERNAL FRICTION FOR DETECTING CRACK FORMATION IN A SCALE MODEL OF AN OFFSHORE STRUCTURE
D. C. Fresch, L. L. Yeager, A. A. Hochrein, Jr., and A. P. Thiruvengadam Sep. 1978 51 p refs
(Contract N00014-77-C-0567)
(AD-A069535; DAI-DF-7763-001-TR) Avail: NTIS HC A04/MF A01 CSCL 14/2

The safety and reliability of offshore structures and critical components are becoming increasingly recognized as a major area requiring utilization of advanced technology for detecting and evaluating incipient crack formation by nondestructive evaluation. These operating structures and critical components are exposed to extreme oceanic environments including dynamic forces (wave loads, wind loads, ice loads, etc); sea water corrosion; spray erosion; and wide fluctuations in temperature. Although adequate factors of safety and modern engineering practices are employed in designing and operating these structures, it is impossible to anticipate and evaluate properly all of the environmental factors in order to ensure the safety and reliability of the system. Because of the complex interaction of the wide spectrum of environmental and material factors, it is imperative that inspection techniques be utilized. One method for system evaluation is to employ a suitable nondestructive evaluation (NDE) technique that would indicate impending material failure. GRA

N79-32565# Los Alamos Scientific Lab., N. Mex.
SIMULATED NEUTRON TOMOGRAPHY FOR NONDESTRUCTIVE ASSAYS
R. P. Kruger and R. A. Morris 1979 7 p refs
(Contract W-7405-eng-36)
(LA-UR-79-938) Avail: NTIS HC A02/MF A01

The results of an on-going research project to assess the use of resonance-neutron computed-tomography for the assay of fissile materials is discussed. A simulation study indicated the potential value of this technique for the nondestructive inspection of a standard to be fabricated by the National Bureau of Standards. DOE

N79-32566# Danish Research Center for Applied Electronics, Hoersholm.
LIGHT EMITTING DIODES. A COMPARATIVE 10,000 HOUR SERVICE TEST OF LIGHT EMITTING DIODES, INCLUDING 26 VARIANTS FROM 15 MANUFACTURERS
H. J. Nordby Nov. 1978 42 p Sponsored by Soc. for Reliability and Environ. Testing (SPM) Original contains color illustrations (ECR-85) Avail: NTIS HC A03/MF A01

Visible (23 types) and infrared (3 types) light emitting diodes (LED) were tested. Each type of LED was represented in four groups and exposed to four different environments. None of the LED's were overloaded with respect to the manufacturer's specifications. During the service life test the radiant flux from each LED was measured and recorded. In this way it was possible to produce a degradation curve (radiant flux versus elapsed time) for each exposure. The results of the investigation demonstrate that all devices show degradation during the 10,000 hour test. Some 30% of the devices show an average degradation or more that 50% while some 2.4% of the LED's show catastrophic failure. Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N79-32567 Pennsylvania Univ., Philadelphia.
STATIC AND DYNAMIC FINITE DEFORMATIONS OF

VISCOELASTIC SOLIDS AND STRUCTURES Ph.D. Thesis
Brian Joseph Sullivan 1979 235 p
Avail: Univ. Microfilms Order No. 7919525

Static and dynamic finite deformation problems involving viscoelastic cables, circular plates, and shells of revolution are investigated. The solution procedure used by the author offers a distinct advantage in problems of this type over the numerical techniques for handling the nonlinearities that are typically used and which are iterative in nature. By means of this technique, the rate equation method, a set of linear differential equations in the displacement rates and stress resultant rates are obtained from the governing nonlinear differential equations associated with finite deflections. The rate equation method allows a unified approach for solving both static and dynamic geometrically nonlinear problems in a highly efficient numerical manner without the use of iteration techniques. Dissert. Abstr.

N79-32568 Lehigh Univ., Bethlehem, Pa.
GROWTH CHARACTERISTICS OF A THROUGH CRACK IN A PLATE OF FINITE THICKNESS Ph.D. Thesis
Bruce Vaughn Kiefer 1979 274 p
Avail: Univ. Microfilms Order No. 7919977

The process of slow stable crack growth in a material and the effects of the slow growth on the material's load-carrying capability are investigated. A crack growth criterion, based on the hypotheses of the strain energy density theory, is used in conjunction with finite element stress analysis procedures to predict the nature of the stable crack extension. The strain energy density theory postulates the onset, direction, and amount of crack extension when material elements near the leading edge of a crack reach a critical energy density. Dissert. Abstr.

N79-32569 Pennsylvania Univ., Philadelphia.
CONTACT STRESSES ON BODIES WITH ARBITRARY GEOMETRY Ph.D. Thesis
Jalal Sd. Hashemi 1979 137 p
Avail: Univ. Microfilms Order No. 7919465

A general formulation of frictionless contact stress problems is given. An inverse iteration method is introduced, which converts the problem to the solution of an integral equation subject to a boundary condition. By modifying the previously described simply discretized method, and by introducing an automatic mesh generating procedure for the changing contact region, it was possible to solve the integral equation for pressure distribution and the contact patch, numerically. The method made major improvements in the generality, stability, accuracy and efficiency of the numerical procedure. Several numerical examples of counterformal and conformal problems were solved, which include the first known solutions of non-Hertzian counterformal and conformal contact of a railroad wheel and rail. Dissert. Abstr.

N79-32570 Georgia Inst. of Tech., Atlanta.
A FRACTURE MECHANICS EVALUATION OF CREEP INDUCED EMBRITTLEMENT Ph.D. Thesis
Lo Hung Chih 1979 105 p
Avail: Univ. Microfilms Order No. 7919557

A fracture mechanics evaluation of creep induced embrittlement of the steel alloy 17-22A(S) at an elevated temperature of 1100 F was made. The results indicate that the embrittlement effects previously detected by use of the notched and unnotched creep tests as well as some other methods can be detected and determined quantitatively by use of fracture mechanics techniques. The test results obtained by the use of fracture mechanics techniques, however, can be more readily used in design problems because they can be incorporated in stress and strain analyses. It was found that fracture toughness for the material used was not a constant but rather to be time dependent under the testing conditions. Furthermore, since embrittlement reactions can be expected to be temperature and creep stress level dependent, the potential problems involved in design considerations may make an analysis quite difficult.
Dissert. Abstr.

N79-32571 California Inst. of Tech., Pasadena.
DISCONTINUOUS DEFORMATION GRADIENTS IN PLANE FINITE ELASTOSTATICS OF INCOMPRESSIBLE MATERIALS. 1: GENERAL CONSIDERATIONS. 2: AN EXAMPLE Ph.D. Thesis
Rohan Chandra Abeyaratne 1979 162 p
Avail: Univ. Microfilms Order No. 7920349

The possibility of the change of type of the differential equations governing finite plane elastostatics for incompressible elastic materials, and the related issue of the existence of equilibrium fields with discontinuous deformation gradients is investigated. Explicit necessary and sufficient conditions on the deformation invariants and the material for the ellipticity of the plane displacement equations of equilibrium are established. The issue of the existence locally, of elastostatic shocks (elastostatic fields with continuous displacements and discontinuous deformation gradients) is studied. It is shown that an elastostatic shock exists only if the governing field equations suffer a loss of ellipticity at some deformation. Conversely, if the governing field equations have lost ellipticity at a given deformation at some point, an elastostatic shock exists, locally, at that point. The results obtained are valid for an arbitrary homogeneous, isotropic, incompressible, elastic material. Dissert. Abstr.

N79-32572 Notre Dame Univ., Ind.
DYNAMIC ANALYSIS OF CYLINDRICAL SHELLS WITH CUTOUTS AND CRACKS Ph.D. Thesis
Hasan Tahsin Tezduyar 1979 205 p
Avail: Univ. Microfilms Order No. 7919961

Steady-state vibrations of a finite cylindrical shell with cutouts and cracks subjected to harmonic surface load were studied. The dynamical form of Morley's governing differential equations are derived and utilized to remove the rather severe restrictions imposed by Donnell's equations. By utilizing the fast and accurate least squares boundary point matching technique, the coefficients of the exact solution to the governing differential equations are determined by employing the principle of superposition. A digital computer program was written to determine the distribution of stress resultants and corresponding stress concentration factors in the shell. The distribution patterns around and the stress attenuations away from cutouts are illustrated. The important case of an axial crack as the limiting case of an elliptical cutout is investigated and stress intensity factors in the vicinity of the crack tip as well as their attenuation away from the crack zone are examined and illustrated. Dissert. Abstr.

N79-32573 New Jersey Inst. of Technology, Newark.
INPLANE AND OUT OF PLANE BUCKLING OF THICK RINGS SUBJECTED TO HYDROSTATIC PRESSURE Ph.D. Thesis
Thomas Michael Juliano 1979 179 p
Avail: Univ. Microfilms Order No. 7920445

The equations of equilibrium from nonlinear elasticity theory are used to describe two adjacent equilibrium positions, i.e., an initial and final state. The initial position problem is assumed to be governed by linear theory. The resulting incremental value equations obtained by subtracting the two equilibrium states, are also linear in nature. These problems are reduced to a one dimensional ring theory problem by the method of power series expansion of the displacements in the radial and axial directions and Fourier series expansions in the circumferential direction, and then by integrating through the thickness and depth of the ring. Several rings with rectangular cross sections were analyzed by these three methods, i.e., (1) thick ring theory with unknown coefficients, (2) thin ring theory with unknown coefficients, and (3) thin ring theory with known coefficients. Dissert. Abstr.

N79-32574*# Delaware Univ., Newark. Center for Composite Materials.
BEHAVIOR OF COMPOSITE BOLTED JOINTS AT ELEVATED TEMPERATURE
Dale W. Wilson and R. Byron Pipes Washington NASA Sep. 1979 108 p refs
(Grant NsG-1409)
(NASA-CR-159137; CCM-1-78) Avail: NTIS HC A06/MF A01 CSCL 20K

Experimental results from an investigation which examines the combined effects of temperature, joint geometry and out-of-plane constraint upon the response of mechanically fastened composite joints are presented. Data are presented for simulated mechanically fastened joint conditions in two laminate

configurations fabricated from Hercules AS/3501-6 graphite-epoxy. Strength and failure mode results are presented for the test temperatures of 21 C, 121 C and 177 C and for a range of the geometric parameters W/D and e/D from 3.71 to 7.43 and 1.85 to 3.69, respectively. A hole diameter, D of 5.16 mm was utilized for all tests. Pin bearing tests with out-of-plane constraint were conducted at room temperature only. All elevated temperature data were generated for pin bearing conditions. Ultrasonic C scan inspection of the failed specimens was employed to assess the damage region and to determine failure mode. Comparative data are presented for pin bearing and out-of-plane constraint conditions for the above mentioned joint configurations. The joint under pin loading was modeled by two dimensional finite element methods. Predicted net section strain concentrations were compared with experimental results. M.M.M.

N79-32575*# Old Dominion Univ. Research Foundation, Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
PHOTOELASTIC STUDIES OF ADVANCED LAP JOINT CONCEPT Final Report, 15 Mar. 1978 - 30 Sep. 1979
R. Prabhakaran Oct. 1979 10 p
(Grant NsG-1507)
(NASA-CR-162316) Avail: NTIS HC A02/MF A01 CSCL 20K

Photoelasticity was introduced as a quantitative tool in the experimental stress analysis of anisotropic birefringent composite model materials. The investigation was divided into three parts: (1) separation of principal stresses or strains, (2) photoelastic calibration, and (3) development of model-prototype relations. R.E.S.

N79-32576# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
NUMERICAL ANALYSIS OF PRESSURE VESSELS USING VARIOUS SHELL THEORIES
Tarun Kant and Sunil Patil Mar. 1979 444 p refs
(IIT-B/CE-79-1) Avail: NTIS HC A19/MF A01

Governing equations describing the behavior of a general shell form, subjected to both mechanical and thermal loads, are presented specifically for two thick shell theories in addition to a so-called thin shell theory. The general equations were particularized for axisymmetric shells, and were cast into a set of coupled first-order-ordinary differential equations, for numerical integration coupled with segmentation. Application of this formulation is shown for the various aspects of pressure vessel analysis. For individual titles, see N79-32577 through N79-32582.

N79-32577# Indian Inst. of Tech., Bombay.
NUMERICAL ANALYSIS OF PRESSURE VESSELS USING VARIOUS SHELL THEORIES: INTRODUCTION
In its Numerical Anal. of Pressure Vessels Using Various Shell Theories Mar. 1979 p 1-4 (For primary document see N79-32576 23-39)
Avail: NTIS HC A19/MF A01

Brief remarks are given on pressure vessels and the need for the use of refined or improved shell theories, to better structurally analyze them. The aims and scope of the investigation are outlined. G.Y.

N79-32578# Indian Inst. of Tech., Bombay.
A CRITICAL REVIEW OF RELEVANT LITERATURE
In its Numerical Anal. of Pressure Vessels Using Various Shell Theories Mar. 1979 p 5-50 (For primary document see N79-32576 23-39)
Avail: NTIS HC A19/MF A01

Literature relating to the stress analysis of pressure vessels was reviewed under the following broad categories: (1) development of linear shell theories; (2) openings in various shell forms; (3) pressure vessels with cylindrical nozzles; (4) reinforcements for pressure vessels; and (5) various end closures for cylindrical pressure vessels. G.Y.

N79-32579# Indian Inst. of Tech., Bombay.
PROBLEM FORMULATION
In its Numerical Anal. of Pressure Vessels Using Various Shell Theories Mar. 1979 p 51-104 (For primary document see N79-32576 23-39)
Avail: NTIS HC A19/MF A01

A brief resume of the governing differential equations describing the behavior of a general shell form is presented for three shell theories. Details of the derivations are omitted for the sake of brevity. The basic plate or shell problem is formulated in terms of a system of equations comprising of the strain-displacement relations, equilibrium equations in terms of stress-resultants, the stress-strain relations, stress-resultants/strain relations, and finally the boundary conditions consistent with the initial assumptions. G.Y.

N79-32580# Indian Inst. of Tech., Bombay.
NUMERICAL ANALYSIS
In its Numerical Anal. of Pressure Vessels Using Various Shell Theories Mar. 1979 p 105-147 (For primary document see N79-32576 23-39)
Avail: NTIS HC A19/MF A01

In order to establish the application of theoretical formulation for the analysis of pressure vessels, the numerical evaluation of the governing system of equations is necessary. The availability of the high speed digital computers dramatically enhanced the importance of numerical methods over the analytical methods. The numerical integration technique coupled with segmentation is used for the analysis. The step-by-step procedure is explained in detail. A system of computer programs, in FORTRAN, is developed for the analysis of a general pressure vessel geometry, which can be run on any of the computer systems, viz., DEC-10, CDC-3600-160A and EC-1030. G.Y.

N79-32581# Indian Inst. of Tech., Bombay.
NUMERICAL RESULTS
In its Numerical Anal. of Pressure Vessels Using Various Shell Theories Mar. 1979 p 149-331 (For primary document see N79-32576 23-39)
Avail: NTIS HC A19/MF A01

In order to establish the reliabilty of a shell theory, and the efficiency of the numerical technique for the analysis of pressure vessels, numerical examples drawn from literature are considered. Each example exhibits a unique aspect of the problem. The first four numerical examples illustrate the use of a shell theory for the different shell forms and different loading patterns. A fifth example takes into account the thermal loading. A confirmation of an applicability of the theoretical formulation and numerical technique for junction problems (discontinuous shell geometries) is made in the next three examples. In addition, the last four examples are analyzed by three shell theories and results are compared. The numerical examples cover both structurally thin and thick shells of revolution. G.Y.

N79-32582# Indian Inst. of Tech., Bombay.
NUMERICAL ANALYSIS OF PRESSURE VESSELS USING VARIOUS SHELL THEORIES: DISCUSSIONS AND CONCLUSIONS
In its Numerical Anal. of Pressure Vessels Using Various Shell Theories Mar. 1979 p 331-339 (For primary document see N79-32576 23-39)
Avail: NTIS HC A19/MF A01

Discussions are made regarding the need for a realistic and reliable analysis of pressure vessel junctions, and the application of a numerical integrations technique. The results obtained by this technique are also discussed. A few remarks regarding the scope for future work are also made. G.Y.

N79-32583# Wisconsin Univ. - Madison. Mathematics Research Center.
THE SOLUTION OF THE AXISYMMETRIC ELASTIC-PLASTIC TORSION OF A SHAFT USING VARIATIONAL INEQUALITIES
C. W. Cryer Apr. 1979 51 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS-77-26732)
(AD-A070207; MRC-TSR-1948) Avail: NTIS HC A04/MF A01 CSCL 20/11

The axisymmetric elastic-plastic torsion of a shaft subject to the von Mises yield criterion is considered. The problem is reformulated as a variational inequality and it is proved that the problem has a unique solution. Some properties of the solution are derived. GRA

N79-32584# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
RESIDUAL STRESSES IN GROUND STEELS
H. Doelle and J. B. Cohen 13 Jun. 1979 33 p refs
(Contract N00014-75-C-0580)
(AD-A070798; TR-24) Avail: NTIS HC A03/MF A01 CSCL 11/6

A new x-ray method for the evaluation of three dimensional (residual) stress states is demonstrated by studies of the effect of grinding on Armco-iron and a medium carbon steel. Although the penetration depth of the Cr-radiation employed in this study is only 5 microns, there is evidence of residual stresses normal to the surface (normal and shear components). In the past it has been assumed that these stress components can be neglected. Shear stresses normal to the surface are small in Armco iron, but significant (+ or - 60 MPa) in steel. From the sign of the shears, the direction of final grinding can be determined. Cooling decreases the tensile stresses parallel to the surface in steel; surprisingly, the opposite result is found in Armco-iron. GRA

N79-32585# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.
FRACTURE ALONG PLANAR SLIP BANDS
D. A. Koss and K. S. Chan Jun. 1979 20 p refs
(Contract N00014-76-C-0037)
(AD-A070788; TR-10) Avail: NTIS HC A02/MF A01 CSCL 11/6

The conditions for propagation of a crack along an inhomogeneous slip band is considered. Allowing slip to occur in the crack plane but restricting the shear displacement to the crack plane results in a relaxed 'elastic-plastic' state of stress near the crack-tip. Calculations of the resulting crack-tip flow behavior indicate that once a crack with a co-planar shear band has formed, it becomes difficult to activate secondary slip with a shear displacement inclined to the crack plane and inhomogeneous slip prevails. The difficulty of activating non-coplanar secondary slip results in large hydrostatic and normal stress near the crack-tip. The combination of large shear strain due to the inhomogeneous shear band and large normal or hydrostatic stresses present near the crack-tip leads to easy crack propagation along such bands. Fracture along slip bands in Ni-, Al-, and Ti-base alloys is briefly discussed in terms of the model. GRA

N79-32586# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
SIXTH ORDER ANALYSES OF CLOSURE IN A CRACKED-ELASTIC-PLASTIC PLATE Ph.D. Thesis - Carnegie-Mellon Univ.
Francis S. Heming Nov. 1978 156 p refs
(AD-A070466; AFIT-CI-79-98D; SM-78-25) Avail: NTIS HC A07/MF A01 CSCL 20/11

The bending of a plate containing a centrally located, through crack is analyzed. Results are obtained numerically via a finite element analysis based on the assumptions of Mindlin sixth order plate theory, which admits three boundary conditions at any point and includes the effects of transverse shear. Elastic and elasto-plastic results are presented for two cases, one that includes the effects of closure and one that does not. The influence of closure on the local displacements, stress distributions, bending stress intensity factors, crack tip blunting, and the growth of the plastic enclave is demonstrated. The effect of thickness and the significance of transverse shear is also discussed. The results show that boundary conditions are critical to the modelling process, that the effects of closure are significant and must be included when demanded by the actual physical situation, and that the important issues regarding the plate bending problem have been identified and analyzed, so that issues regarding more detailed behavior may be addressed. Author (GRA)

N79-32587# Wisconsin Univ. - Madison. Mathematics Research Center.
APEX SINGULARITIES FOR CORNER CRACKS UNDER OPENING, SLIDING, AND TEARING MODES Summary Report
B. Noble, M. A. Hussian, and S. L. Pu Mar. 1979 16 p refs
(Contract DAAG29-75-C-0024)
(AD-A070200; MRC-TSR-1940) Avail: NTIS HC A02/MF A01 CSCL 20/11

Power singularities at the apex of a flat, wedge-shaped, angular-sector crack in a three dimensional solid are studied. Using Boussinesq stress functions of elasticity theory, the problem is reduced to an eigenvalue problem of a dual series. The stress singularity is found to be stronger or weaker than one half, depending upon whether the apex angle is greater or less than 180 degrees. This tends to accelerate or retard the crack growth at the apex until the crack front straightens out. GRA

N79-32588# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
X-RAY DIFFRACTION MEASUREMENTS OF CRACK TIP STRESSES AS A CRACK ADVANCES THROUGH A SINGLE OVERLOAD AFFECTED ZONE Final Report, Nov. 1977 - Jul. 1978
Donald R. Holloway Mar. 1979 32 p refs
(AF Proj. 2307)
(AD-A070193; AFFDL-TR-79-3006) Avail: NTIS HC A03/MF A01 CSCL 20/11

Stress levels were measured in the vicinity of a crack tip using an X-ray diffraction technique to determine the correlation of these measurements with crack closure and residual stress theories. A single tensile overload was applied to a modified compact specimen of 1020 steel. The material had been heat-treated to obtain an ASTM grain size of 10 to 11 and a yield strength of 70 ksi. Crack tip residual stresses were measured in the unloaded condition and crack tip applied stresses were measured under load. These measurements were made as the crack was extended into and past the overload affected zone. Results suggested that overload retardation was primarily due to residual compressive stresses generated at the point of overload. It was observed that the effect of the overload had dissipated by the time the crack was propagated through a distance approximately equal to the plastic zone caused by the overload. GRA

N79-32589# Wisconsin Univ. - Madison.
TEMPERATURE BASED STRESS ANALYSIS OF NOTCHED MEMBERS Final Report
B. I. Sandor and E. H. Jordan Wright-Patterson AFB, Ohio AFFDL Mar. 1979 136 p refs
(Grant AF-AFOSR-3194-77; AF Proj. 2307)
(AD-A070372; AFFDL-TR-78-176) Avail: NTIS HC A07/MF A01 CSCL 20/11

The purpose of this effort was to develop and demonstrate a method of experimentally determining both elastic and plastic strain distributions in metallic materials. This was accomplished by recording minute temperature changes on the surface of the material as it was subjected to various loading conditions. Mathematical relationships relating these changes to the strain in the material was developed and verified. Much of the success of this effort was due to the development of thermocouple attachment and readout technique that recorded minute temperature changes (0.1 degree centigrade) at ten millisecond sample intervals. This small time period sampling assures that heat has not been conducted away from the thermocouple attachment point. The thermocouples consisting of two .13 mm dissimilar metal wires were attached to the surface 0.1 mm apart by discharging a large capacitor grounded to the specimen. The small size permits the mounting of several thermocouples in a small area. The determination of plastic zone outlines is thereby facilitated. Author (GRA)

N79-32590# Oak Ridge National Lab., Tenn.
STRESS ANALYSIS OF CYLINDRICAL PRESSURE VESSELS WITH CLOSELY SPACED NOZZLES BY THE FINITE-ELEMENT METHOD. VOLUME 2: VESSELS WITH TWO NOZZLES UNDER EXTERNAL FORCE AND MOMENT LOADINGS
F. K. W. Tso and R. A. Weed 13 Jul. 1978 102 p refs
(Contract W-7405-eng-26)
(NUREG-CR-0132; ORNL/NUREG-18/V2) Avail: NTIS HC A06/MF A01

A finite element computer program, MULTINOZZLE, was developed for the stress analysis of cylindrical pressure vessels with one, two, or three closely spaced reinforced nozzles. MULTI-NOZZLE consists of two modules which may be operated

independently. The first module, FEMG, automatically prepares a finite element mesh, including the nodal point coordinates, finite element connectivities, mesh options, and boundary value specifications for input to the finite element solution module SAP3M. SAP3M, which is a modified and improved version of the SAP3 computer program, computes the nodal point displacements and stress tensor components and prints and/or stores the results for later postprocessing. The present volume demonstrates the program's ability to analyze one and two-nozzle vessels with external loads. DOE

N79-32591# Parsons (Ralph M.) Co., Pasadena, Calif.
PRESTRESSED CONCRETE PRESSURE VESSELS: CONCEPTUAL DESIGN/ECONOMIC, EXECUTIVE SUMMARY Interim Report
Sep. 1978 44 p refs
(Contract EX-76-C-01-1775)
(FE-1775-19; R/D-114; IR-8) Avail: NTIS HC A03/MF A01

The results are summarized for a study which determined that the use of prestressed concrete pressure vessels (PCPV's) in coal conversion plants is technically feasible and offers potential economic advantages. Four representative types of PCPV's were studied. Depending on the type of PCPV, it was found that reductions in fixed capital investment as high as 70%, amounting to as much as $300 million, are possible by the substitution of large PCPV's for steel vessels; the PCPV's would use state-of-the art technology and proven construction methods and equipment. Continued development of prestressed concrete pressure vessels is recommended. DOE

N79-32592# Oak Ridge National Lab., Tenn.
STRUCTURAL MODEL TESTING FOR PRESTRESSED CONCRETE PRESSURE VESSELS: A STUDY OF GROUTED vs NONGROUTED POSTTENSIONED PRESTRESSING TENDON SYSTEMS
D. J. Naus Apr. 1979 192 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6478) Avail: NTIS HC A09/MF A01

The experimental investigation was divided into four phases: (1) grouted-nongrouted tendon behavior, (2) evaluation of selected new material systems, (3) bench-scale corrosion studies, and (4) preliminary evaluation of acoustic emission techniques for monitoring grouted tendons in prestressed concrete pressure vessels (PCPV). The groutability of large tendon systems was also investigated. Results indicate that grouted tendon flexure specimens exhibit improved performance relative to nongrouted members; the polymer-silica and fibrous concrete material systems exhibit potential for applications to PCPVs; the corrosion-inhibiting ability of grout in the environments investigated is equivalent to that of organic-petrolatum-based commercial corrosion inhibitors; acoustic emission is capable of monitoring plain concrete and simple concrete structures; and techniques are available for grouting large prestressing tendon systems such as would be used in a PCPV. DOE

N79-32593# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.
EFFECT OF SHEET METAL THICKNESS ON CRACK PROPAGATION [EINFLUSS DER BLECHDICKE AUF DEN RISSFORTSCHRITT]
J. H. Argyris, W. Aicher, H. J. Ertelt, F. Karl, and G. Kierner 1978 114 p refs In GERMAN
(Contract DFG-AR-44/34)
(ISD-240) Avail: NTIS HC A06/MF A01

Relations between fabrication procedures, stresses, and crack propagation were investigated in order to provide manufacturers with the information necessary to optimize series light metal constructions. Duralumin samples with thicknesses ranging from 0.6 to 8mm were studied. A special system was developed for automatically measuring crack lengths. The samples were subjected to both static and dynamic stresses. Variations in the critical stress intensity factor Kc were measured. A finite element simulation method was used to study an infinitely wide sample. Some correlation between theory and experiment exists although crack propagation behavior is very dependent on the sample's history (lamination, annealing). More experiments are needed to obtain conclusive results. Author (ESA)

N79-32594# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Dept.
A FINITE ELEMENT MODEL TO STUDY THE BUCKLING BEHAVIOR OF GENERAL ORTHOTROPIC, MIDPLANE SYMMETRIC, ELASTIC PLATES
J. F. M. Wiggenraad Jan. 1979 28 p refs
(Contract NIVR-1808)
(NLR-TR-77062-U) Avail: NTIS HC A03/MF A01

A finite element model was developed which incorporates the bending-torsional coupling effect as it occurs in general orthotropic, midplane symmetric, elastic plates in order to analyze its influence on the buckling behavior of such plates. Some of the results were compared with known exact and approximate solutions. Indications are that values for the case of pure compression are more accurate than for the case of pure shear. Values derived for simply supported plates are also more accurate than those for clamped plates. It is concluded that a 4 x 4 grid size gives good results for the analysis of the stability of isotropic and special orthotropic plates. However, for general orthotropic plates an increase in grid size is necessary. Author (ESA)

N79-32595# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
FRACTURE MECHANICS AND AMBIENT TEMPERATURE SUSTAINED LOAD FRACTURE
R. J. H. Wanhill and H. P. vanLeeuwen 18 Mar. 1978 29 p refs Presented at Intern Symp. on Fracture Mech., Washington, D. C., Sep. 1978
(NLR-MP-78008-U) Avail: NTIS HC A03/MF A01

A generalized discussion of the phenomenological dependance of ambient temperature sustained load fracture on fracture mechanics parameters is presented. The practical interpretation and application of this analysis technique during structural materials selection is reviewed for stress corrosion cracking as well as for delayed failure in steel following galvanic plating, crack growth in gaseous hydrogen, sustained load cracking in titanium alloys, and for liquid metal embrittlement. Experimental problems encountered using this screening analysis, such as incubation time and rising load tests, pre-crack morphology, crack morphology, curved crack fronts, side grooves, and crack growth rate measurements are then considered. An in depth review of the mechanisms and theory of sustained load fracture is also given. Author (ESA)

N79-32596# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
ENGINEERING APPLICATION OF FRACTURE MECHANICS TO FLIGHT SIMULATION
R. J. H. Wanhill May 1978 12 p refs Presented at Intern. Conf. on Fracture Mech. in Eng. Appl., Bangalore, India, Mar. 1979
(NLR-MP-78015-U) Avail: NTIS HC A02/MF A01

Experimental data on the fracture mechanics of flight simulation crack propagation were studied and a characteristic, K, was derived. The phenomena considered were design stress level, gust severity, spectrum truncation, and crack growth from one of both sides of a hole. Results show that for a change in design stress level up to 25% the data is correlated fairly well by K, except when crack growth rate correlations due to severe flights were not transient with respect to the overall trend of growth rates. Gust severity effects are correlated by Ka sub rms, the stress intensity pertaining to the root mean square of the gust amplitudes. However, gust alleviation and spectrum truncation effects are not correlatable by a K value descriptive of changes in the load excursion magnitudes. Crack growth rates at each tip of a crack at one or both sides of a circular hole are correlated by a characteristic K. Author (ESA)

N79-32597# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
GUST SPECTRUM FATIGUE CRACK PROPAGATION IN CANDIDATE SKIN MATERIALS
R. J. H. Wanhill May 1978 32 p refs Submitted for publication
(NLR-MP-78022-U) Avail: NTIS HC A03/MF A01

Flight simulation fatigue crack propagation tests were carried out on 2024-T3, 7475-T761, and mill annealed Ti-6Al-4V sheet in thicknesses up to 3 mm. These materials are representative

of those used in transport aircraft lower wing skin stiffened panels with end load capacities of 1.5 and 3 MN/m. The performance of 2024-T3 was much superior to the others, owing mainly to greater retardation of crack growth after severe flights. The effect of load truncation was also greater for 2024-T3. The significance of the results of the choice of advanced structural concepts and materials, and the choice of truncation level is discussed. A recommendation for further investigation is given. Author (ESA)

N79-32598# Oxford Univ. (England). Dept. of Engineering Science.

EFFECT OF DEEP WEDGE-SHAPED NOTCHES OF SMALL FLANK ANGLE ON PLASTIC FAILURE

Masaki Shiratori and Bradley Dodd 1979 15 p refs

(OUEL-1282/79) Avail: NTIS HC A02/MF A01

Green's slip-line field for the plane-strain plastic bending of a plate with a wedge-shaped notch of small angle is generalized to take into account axial force. Two constraint factors are derived, T1 due to the axial force and M1 due to the bending moment, where the moment is taken about the mid-point of the ligament length. These constraint factors are mapped in constraint factor space providing general yielding loci. It is shown that the slip-time field solution becomes inadmissible for certain combinations of axial force and bending moments and Rice's upper bound solution is used under these circumstances. Author (ESA)

N79-32599# Bari Univ. (Italy). Ist. di Costruzioni di Macchine.

THE DYNAMIC ANALYSIS OF STRUCTURES: A COMPARISON BETWEEN TWO DIFFERENT VERSIONS OF STRUDL 2

Bruno Atzori and Franco Fresa 1978 24 p refs

Avail: NTIS HC A02/MF A01

The various possibilities for performing a dynamic structural analysis, available in two different versions of STRUDL 2, were evaluated in relation to very simple structures for which the analytical solutions are known. The study was performed using mainly beam elements. The values of the C.P.U. time required to perform the various analyses are also given as a function of the number of degrees of freedom of the analysed structure. Results stress the applications of the programs for both solving real-life problems and as a pedagogical aid to engineering students. Author (ESA)

N79-32600# Royal Aircraft Establishment, Farnborough (England).

THE AXIAL LOADING CORROSION FATIGUE PROPERTIES OF 25mm THICK HIGH AND LOW STRENGTH X166 PLATE (DTD 5120 AND DTD 5130)

N. J. F. Gunn and J. T. Ballett London Sep. 1978 20 p refs Sponsored by Min. of Defense

(RAE-TR-78114; BR65880) Avail: NTIS HC A02/MF A01

Axial loading fatigue tests were made at R = 0.1 in laboratory air and in a 3.5 NaCl fog using holed transverse sheet type test pieces (K = 2.52) cut from the mid-position of 25 mm thick, high and low strength X166 plates. The test program was undertaken to determine the effect of a salt-fog environment on the fatigue properties of the two alloys. At 2 x 10 to the 7 power cycles the fatigue strength of the high strength X166 plate (DTD 5120) was reduced by 60% (from 162 MPa to 58 MPa) while that of the low strength X166 plate (DTD 5130) was reduced by approximately 40% (from 132.5 MPa to 77.5 MPa). Author (ESA)

N79-32601# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Sec. Construction Metallique.

STRESS CONCENTRATION FACTORS IN SPHERES WITH RADIAL FLUSH NOZZLES

Rudy Beeckman Feb. 1979 28 p refs Presented at Seminar on Machine Mech., Ghent Sponsored by Inst. pour l'Encouragement de la Rech. Sci. dans l'Ind. et l'Agr.

(CRIF-MT-129) Avail: NTIS HC A03/MF A01

A parametrical study was made of the stress distribution in spherical vessels with a radially flush nozzle. Three loading cases are considered. These are internal pressure, thrust applied to the nozzle, and moment applied to the nozzle. Results show that as long as the shell structure can be considered as relatively thin and when the thickness of the nozzle does not exceed the thickness of the sphere, the maximum stress always occurs through the base of the nozzle for all loading cases. For the cases of thrust applied to the nozzle and moment applied to the nozzle this maximum stress is the meridional stress, whereas for the case internal pressure it is either the meridional or the circumferential stress, depending on geometrical parameters. Author (ESA)

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N79-32602 Illinois Univ. at Urbana-Champaign.

LIMITING MECHANISMS OF DISLOCATION MOTION IN ICE Ph.D. Thesis

Sekyung Lee 1979 123 p

Avail: Univ. Microfilms Order No. 7915381

In order to quantitatively evaluate these model predictions, the time constants and the activation energies associated with the relaxation process were measured in pure ice and in HF-doped ice crystals using internal friction measurements, and velocities were calculated. The behavior of dislocation loops bowing-out between obstacles was also investigated. Major conclusions of the study are: (1) Continuum calculations of the long range stress-induced ordering is able to account for the observed dislocation drag in pure ice. (2) HF-doping appears to be useful only for the rough qualitative analysis of the limiting mechanisms for dislocation motion. (3) The curvature of a bowing-out loop reguires an effective line tension approximately two orders of magnitude greater than that expected on the basis of an elastic line tension argument. Dissert. Abstr.

N79-32603*# National Environmental Satellite Service, Washington, D. C.

SELECTED HYDROLOGIC APPLICATIONS OF LANDSAT-2 DATA: AN EVALUATION Final Report

Donald R. Wiesnet, David F. McGinnis, Jr., and Michael Matson, Principal Investigators 1978 205 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS (Contract NAS5-3991)

(E79-10264; NASA-CR-162098) Avail: NTIS HC A10/MF A01 CSCL 08H

The author has identified the following significant results. Estimates of soil moisture were obtained from visible, near-IR gamma ray and microwave data. Attempts using GOES thermal-IR were unsuccessful due to resolutions (8 km). Microwaves were the most effective at soil moisture estimates, with and without vegetative cover. Gamma rays provided only one value for the test site, produced by many data points obtained from overlapping 150 meter diameter circles. Even though the resulting averaged value was near the averaged field moisture value, this method suffers from atmospheric contaminants, the need to fly at low altitudes, and the necessity of prior calibration of a given site. Visible and near-IR relationships are present for bare fields but appear to be limited to soil moisture levels between 5 and 20%. The densely vegetated alfalfa fields correlated with near-IR reflectance only; soil moisture values from wheat fields showed no relation to either or near-IR MSS data.

N79-32604*# Pennsylvania State Univ., University Park. Dept. of Meteorology.

DETERMINATION OF SURFACE CHARACTERISTICS AND ENERGY BUDGET OVER AN URBAN-RURAL AREA USING SATELLITE DATA AND A BOUNDARY LAYER MODEL M.S. Thesis
Joseph Kent Dodd, Principal Investigator Aug. 1979 96 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-24264)
(E79-10269; NASA-CR-162091) Avail: NTIS HC A05/MF A01 CSCL 04B
There are no author-identified significant results in this report.

N79-32605*# Lockheed Electronics Co., Houston, Tex.
THE ECOLOGICAL VARIATIONS IN THERMAL INFRARED EMISSIVITY OF VEGETATION
G. K. Arp and D. E. Phinney, Principal Investigator Apr. 1979 27 p refs Supersedes LEC-11021-Rev-B EREP
(Contract NAS9-15200)
(E79-10271; NASA-CR-160293; LEC-13390; JSC-14910; LEC-11021-Rev-B) Avail: NTIS HC A03/MF A01 CSCL 08F
The author has identified the following significant results. Through a series of contrasts, the statistical significance of differences in emissivity was determined for vegegation in dry and humid deserts, montane and deciduous rain forests, and the temperate region. No significant differences were found between the two types of desert vegetation or among the types of nondesert vegetation. However, the rain forest vegetation was significantly different from that of the temperate region. On a community-wide level, there is some physiological adaptation in plants to their radiational environment.

N79-32606*# Department of Agriculture, Weslaco, Tex. Science and Education Administration.
PLANT COVER, SOIL TEMPERATURE, FREEZE, WATER STRESS, AND EVAPOTRANSPIRATION CONDITIONS Quarterly Progress Report, 1 Jun. - 1 Sep. 1979
Craig L. Wiegand, Paul R. Nixon, Harold W. Gausman, L. Neal Namken, Ross W. Leamer, and Arthur J. Richardson, Principal Investigators Sep. 1979 5 p Sponsored by NASA ERTS (NASA Order S-40198-B)
(E79-10280; NASA-CR-162145) Avail: NTIS HC A02/MF A01 CSCL 08F
There are no author-identified significant results in this report.

N79-32607*# Geological Survey, Denver, Colo. Petrophysics and Remote Sensing Branch.
GEOLOGIC APPLICATION OF THERMAL-INERTIA MAPPING FROM SATELLITE Progress Report, 1 Dec. 1978 - Feb. 1979
Terry W. Offield, Principal Investigator, Susanne H. Miller, and Kenneth Watson Feb. 1979 5 p Sponsored by NASA ERTS
(E79-10282; NASA-CR-162147) Avail: NTIS HC A02/MF A01 CSCL 08B
There are no author-identified significant results in this report.

N79-32608*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). SAMPLING UNIT SIZE CONSIDERATIONS IN LARGE AREA CROP INVENTORYING USING SATELLITE-BASED DATA
Charles R. Perry, Principal Investigator 1979 17 p refs Presented at Ann. Meeting of the Am. Statistical Assoc., Washington, D. C., 13-16 Aug. 1979 Sponsored by NASA, NOAA, and USDA EREP
(E79-10283; NASA-TM-80511) Avail: NTIS HC A02/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-32609*# Telespazio, S.p.A., Rome (Italy).
EVALUATION OF WATER TRANSPARENCY MEASUREMENTS DERIVED FROM LANDSAT DATA AND GROUND TRUTH: AN EXAMPLE FROM THE TIBER RIVER MOUTH
Angelo Zandonella, Principal Investigator 1979 18 p refs Presented at 4th UN Intern. Training Course on the Application of Remote Sensing Techniques to Fisheries in Cooperation with FAO and Italian Government, Rome, May 1979 Sponsored by NASA ERTS
(E79-10285; NASA-CR-162271) Avail: NTIS HC A02/MF A01 CSCL 08H
There are no author-identified significant results in this report.

N79-32610*# Telespazio, S.p.A., Rome (Italy).
FEATURE SELECTION VIA ENTROPY MINIMIZATION: AN EXAMPLE USING LANDSAT SATELLITE DATA
Angelo Zandonella and Buzz Sellman, Principal Investigators 1979 12 p refs Presented at the 2d Convegno sulle Metodologic di Trattamento dell'Informazione, Trieste, Feb. 1979 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(E79-10286; NASA-CR-162273) Avail: NTIS HC A02/MF A01 CSCL 08F
The author has identified the following significant results. The minimum entropy model may provide several useful advantages over traditional techniques for processing LANDSAT data. Total computer time to conduct a complete pattern recognition process is reduced. Subjective (transformed image), as well as statistically derived information is made available to the analyst/user much earlier in the analysis process. A rapid feedback loop in which numerous training set combinations can be tested for difference and representativeness is available. Additional tests of LANDSAT data processing using the minimum entropy model are clearly justified.

N79-32611*# Lancaster Univ. (England).
SATELLITE MONITORING OF SEA SURFACE POLLUTION Progress Report, period ending 31 Aug. 1979
Gilbert Fielder and Duncan John Telfer, Principal Investigators 31 Aug. 1979 35 p refs Sponsored by NASA ERTS
(E79-10287; NASA-CR-162274; PR-2-13/P5) Avail: NTIS HC A03/MF A01 CSCL 13B
There are no author-identified significant results in this report.

N79-32612*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A FAST ROUTINE FOR COMPUTING
Robert R. Jayroe, Jr. Oct. 1977 22 p
(NASA-TM-78133) Avail: NTIS HC A02/MF A01 CSCL 05B
A routine for calculating multidimensional histograms of multivariate data using a combination table look up and search procedure is described. The software was originally developed to computer four-dimensional histograms from LANDSAT multispectral imagery, but the concept can be used on other types of data and the program can be modified for the desired type of output information. Author

N79-32613# Geological Survey, Washington, D. C.
GEORGIA FROM SPACE: AN EXPLANATION OF THE NASA LANDSAT 1 SATELLITE IMAGE COLOR MOSAIC OF THE STATE OF GEORGIA
Sam M. Pickering, Jr. and Michael W. Higgins 1979 25 p refs Prepared in cooperation with Georgia Dept. of Natural Resources, Atlanta
(Circ-787) Avail: NTIS HC A02/MF A01 CSCL 08F
Fourteen scenes were precisely joined by computer to make the mosaic of Georgia. On the mosaic, high-contrast features as small as 25 acres can be seen. The mosaic shows the cultural features of the State such as cities, roads, and other developments. It shows land use and land cover-woodlands, wetlands, cultivated areas, reservoirs, and so forth. Landforms and geologic features are also easily seen. A.R.H.

N79-32614# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Industrial Engineering and Operations Research.
PREDICTION OF THE RECOGNITION OF REAL OBJECTS AS A FUNCTION OF PHOTOMETRIC AND GEOMETRIC CHARACTERISTICS Technical Report, 16 Mar. 1974 -

15 Mar. 1975
Deborah G. Bonnet and Harry L. Snyder Dec. 1978 111 p refs
(Contract DAHC19-74-G-009)
(AD-A071118; ARI-TR-78-TH7) Avail: NTIS HC A06/MF A01 CSCL 15/4

The purpose of this research was to predict target-by-target acquisition performance of air-to-ground imagery from microdensitometrically determined photometric and geometric characteristics of the scene. Results showed that it is feasible to predict the ground range at which a given target will be detected by an airborne observer. This prediction could be made totally automatically, given reconnaissance imagery, a microdensitometer, and a small computer. Seventeen characteristics of targets, backgrounds, and target/background relationships which reliably correlate to target acquisition performance were identified. Sixty regression equations combining these variables into linear predictive models of target acquisition performance were developed from one set of targets and mission conditions and cross-validated against targets contained in three different reconnaissance missions. GRA

N79-32615# Environmental Research Inst. of Michigan, Ann Arbor. Applications Div.
BASIC REMOTE SENSING INVESTIGATION FOR COASTAL RECONNAISSANCE
D. Lyzenga, R. Shuchman, C. Davis, and G. Suits Jun. 1979 58 p refs Presented at the 13th Intern. Symp. on Remote Sensing of Environ., 23-27 Apr. 1979
(Contract N00014-78-C-0458)
(AD-A070770; ERIM-134400-7-T) Avail: NTIS HC A04/MF A01 CSCL 17/8

Contents: The use of Remote Sensing in the Determination of Beach Sand Parameters; Shallow-Water Reflectance Modeling with Applications to Remote Sensing of the Ocean Floor; and Evaluation of an Algorithm for Mapping Bottom Features Under a Variable Depth of Water. GRA

N79-32616# Summers (W. K.) and Associates, Inc., Socorro, N. Mex.
SURVEY OF THE GROUND-WATER GEOLOGY AND HYDROLOGY OF THE PASCO BASIN, WASHINGTON
W. K. Summers and P. A. Weber Oct. 1978 416 p refs
(Contract EY-76-C-06-1030)
(RHO-BWI-C-41) Avail: NTIS HC A18/MF A01

The suitability of the basalt at the Hanford site as a nuclear waste repository was investigated. An evaluation of the basic data presented include: an evaluation of the basic information available for wells and test holes drilled in the Pasco Basin; a summary of the geologic and hydrologic features of the basin that can be deduced from these data, obtained from published sources, or inferred from a comparison of the Pasco Basin with other basins within the Columbia Plateau; a preliminary conceptualization of the ground-water flow in the Pasco Basin; a statement of the additional work required to substantiate or modify the flow system conceptualized; and a brief appraisal of the potential usefulness of remote-sensing imagery in the evaluation of the ground-water hydrology of the Pasco Basin. DOE

N79-32617# Department of Energy, Washington, D. C. Office of Strategic Petroleum Reserve.
STRATEGIC PETROLEUM RESERVE Annual Report
16 Feb. 1979 89 p Sponsored by DOE
(DOE/TIC-10107; AR-2) Avail: NTIS HC A05/MF A01

Reserve development activities during 1978 are reported. Status of the 9 sites is discussed in appendixes. DOE

N79-32618# Department of Energy, Washington, D. C. Energy Information Administration.
REEXAMINATION OF THE ESTIMATION OF UNDISCOVERED OIL RESOURCES IN THE US
N. Uri Apr. 1979 23 p refs
(DOE/EIA-0103/31; TM/ES/79-03) Avail: NTIS HC A02/MF A01

The estimation of total producible oil in the United States is discussed. Two specific models, a logistic model and a Gompertz model, are suggested and estimated in a fashion consistent with the theoretical consideratons. The results indicate that approximately 159 billion barrels are ultimately recoverable and producible of which 117 billion barrels have been produced through the end of 1978. DOE

N79-32619# Department of Energy, Washington, D. C. Information Administration.
ASSESSMENT OF POTENTIAL US PETROLEUM SUPPLY SHORTFALLS, 1978 - 1980
D. Butler 15 Sep. 1978 40 p refs
(DOE/EIA-0102/13) Avail: NTIS HC A03/MF A01

The 1977 Energy Information Administration projection series was modified to reflect the likelihood of constrained world oil supplies in the 1980's and the associated increases in oil prices required to balance world supply and demand. DOE

N79-32620# Argonne National Lab., Ill. Energy and Environmental Systems Div.
MICELLAR/POLYMER FLOODS FOR ENHANCED OIL RECOVERY: A REVIEW OF DISPLACEMENT MECHANISMS AND THEIR SIMULATION
V. J. Kremesec and J. C. Slattery (Northwestern Univ.) Oct. 1978 46 p refs
(Contract W-31-109-eng-38)
(ANL/ES-74) Avail: NTIS HC A03/MF A01

Current literature is reviewed and criticized in order to explain the qualitative features of the oil displacement process and to point out those areas needing additional research. A comprehensive research program is outlined. The engineering aspects of the design and prediction of micellar/polymer floods in oil reservoirs are examined with emphasis on the physical mechanisms of oil displacement, the parameters that govern those mechanisms, and the numerical simulation of the process. It is felt that these have not been emphasized in the nationally supported research effort to make enhanced oil recovery a viable process. DOE

N79-32621# Department of Energy, Bartlesville, Okla. Energy Technology Center.
EFFECTS OF INTERFACE CONDUCTIVITY ON ELECTRIC LOGGING IN WESTERN GAS SANDS: A LITERATURE REVIEW
J. B. Jennings and H. B. Carroll, Jr. Jun. 1979 26 p refs
(BETC/IC-79/2) Avail: NTIS HC A03/MF A01

A review of the interface or surface conductivity literature is presented. The relationship between the electric double layer theories and interface conduction for clay and silica in formation rock is described. Current mathematical models which relate interface conductivity to rock conductivity are discussed. Suggestions for applied research which could make practical application of interface conductivity theory to logging in western gas sands are presented. DOE

N79-32622# Food and Agriculture Organization of the United Nations, Rome (Italy). Remote Sensing Unit.
ADVANCED TRAINING AND RESEARCH ON SATELLITE REMOTE SENSING TECHNIQUES AND APPLICATIONS IN THE UNITED KINGDOM AND THE UNITED STATES, 1 OCTOBER 1977 TO 30 SEPTEMBER 1978 Final Report
Jelle U. Hielkema 1978 113 p refs Original contains color illustrations
(AGLT/RSU-Series-2/79) Avail: NTIS HC A06/MF A01

Universities and scientific research centers were visited in the U.K. and the United States in order to study different types of satellite remote sensing data for a variety of applications. The development of specific digital data processing and classification techniques for detection, quantifying, and monitoring of desert vegetation using LANDSAT multispectral data was emphasized. It is noted that research and development efforts in the field of satellite remote sensing has become more and more oriented towards computer assisted techniques for data handling, analysis, and interpretation of both environmental and earth resources satellite data. Visual photointerpretation is seen as outmoded and investment in hardware, software, and trained manpower to optimize the use of available data is strongly advised.
Author (ESA)

N79-32623# National Aerospace Lab., Amsterdam (Netherlands). Scientific Services Div.

ELECTRONIC PROCESSING OF INFRARED SCANNER SIGNALS USING CCD MEMORY TECHNIQUES
H. A. vanIngenSchenau 6 Oct. 1978 10 p refs Presented at 1978 Inter. Symp. on the Appl. of Charge Coupled Devices, San Diego, Calif., 25-27 Oct. 1978 Original contains color illustrations
(NLR-MP-78031-U) Avail: NTIS HC A02/MF A01

The design of a video quick look which electronically processes signals from an infrared linescanner for a moving-map presentation on TV display is described. The image memory for display is composed of 16-kbit dynamic charged coupled devices (CCD). These CCD memories are line addressable which is attractive in the case of line scan orientation for sensing and display. The video quick look system is described and the design of the CCD image memory is shown. An application of the video quick look is demonstrated for thermal infrared remote sensing. Author (ESA)

N79-32624# Geological Survey, Reston, Va.
US GEOLOGICAL SURVEY SOURCES OF PHOTOGRAPHS AND IMAGES OF BIOSPHERE RESERVES TAKEN FROM SPACECRAFT AND AIRCRAFT: EVERGLADES NATIONAL PARK
Janet M. Bonner 1979 105 p
(PB-296353/6) Avail: NTIS HC A06/MF A01 CSCL 13B

Remotely sensed data gathered from spacecraft and aircraft are presented for the Everglades National Park biosphere reserve. Computer listings of the data are given. GRA

N79-32625# Lake Champlain Basin Study, Burlington, Vt.
LIMNOLOGY OF LAKE CHAMPLAIN Final Report
Glenn E. Myer and Gerhard K. Gruendling Jan. 1979 429 p refs Prepared by State Univ. of New York at Albany Sponsored in part by New England River Basins Commission
(PB-295612/6; LCBS-30) Avail: NTIS HC A19/MF A01 CSCL 08H

An exhaustive compilation of existing physical, chemical, and biological data on Lake Champlain are presented. As a reference document, the report assembles both published and unpublished information. Data presentation is through text tables, illustrations, and maps. Lake limnology is described for five general lake regions: Main Lake, Northeast Arm, Malletts Bay, Missisquoi Bay, and the South Lake. Major report chapters include: bathymetry and morphometry, bottom characteristics, thermal properties, currents and mass transport, chemical characteristics, nutrient and material loadings, plankton populations, benthic invertebrates, and fisheries. The report also contains an extensive bibliography. GRA

N79-32626# Geological Survey, Tallahassee, Fla. Water Resources Div.
STREAMFLOW SIMULATION STUDIES OF THE HILLSBROUGH ALAFIA, AND ANCLOTE RIVERS, WEST CENTRAL FLORIDA
J. F. Turner, Jr. Feb. 1979 169 p refs
(PB-295569/8; USGS/WRD/WRI-79/010; USGS/WRI-78-102) Avail: NTIS HC A08/MF A01 CSCL 08H

A modified version of the Georgia Tech Watershed Model was applied for the purpose of flow simulation in three large river basins of west-central Florida. Calibrations were evaluated by comparing the following synthesized and observed data: annual hydrographs for the 1959, 1960, 1973 and 1974 water years, flood hydrographs (maximum daily discharge and flood volume), and long-term annual flood-peak discharges (1950-72). Annual hydrographs, excluding the 1973 water year, were compared using average absolute error in annual runoff and daily flows and correlation coefficients of monthly and daily flows. On the basis of these results, it is concluded that flood calibrations have been achieved for stations used in this study. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N79-32627 Carnegie-Mellon Univ., Pittsburgh, Pa.
DYNAMIC MODELING, SIMULATION AND CONTROL OF OCEAN THERMAL ENERGY CONVERSION POWER PLANTS Ph.D. Thesis
Steven Alexander Hetyei 1979 173 p
Avail: Univ. Microfilms Order No. 7919144

Analytical models for major ocean thermal energy conversion (OTEC) plant components were derived. Steady-state operating conditions for the plant were established using the nonlinear algebraic models. The differential equations were linearized about the steady-state operating point. Small signal analysis was carried out by perturbing each input and observing the resultant system outputs. Linear controllers were then proposed to maintain regulation within specified range for the key output variables: generator frequency and voltage. The same linear controller was then applied to the nonlinear plant model. Computer results of the simulation of a 1 MWe OTEC system are presented and discussed for various control strategies including: (1) speed control on the water pumps; (2) bypass shunting of the turbine feed; and (3) control of the evaporator heat transfer coefficient.
Dissert. Abstr.

N79-32628*# RCA Advanced Technology Labs., Camden, N. J. Government Systems Div.
EXPANSION OF CMOS ARRAY DESIGN TECHNIQUES Final Report
A. Feller and P. Ramondetta Mar. 1977 43 p refs
(Contract NAS8-31325)
(NASA-CR-150318) Avail: NTIS HC A03/MF A01 CSCL 10A

The important features of the multiport (double entry) automatic placement and routing programs for standard cells are described. Measured performance and predicted performance were compared for seven CMOS/SOS array types and hybrids designed with the high speed CMOS/SOS cell family. The CMOS/SOS standard cell data sheets are listed and described.
Author

N79-32629# Little (Arthur D.), Inc., Cambridge, Mass.
ENERGY CONSERVATION OPPORTUNITIES IN APPLIANCES USING ENERGY STORAGE Final Report
W. Thompson Lawrence, Elia P. Demetri, and David W. Lee 30 Nov. 1978 203 p refs
(Contract W-7405-eng-26)
(ORNL/SUB-7303/1) Avail: NTIS HC A10/MF A01

Fuel-fired appliances, electric appliances, and utility load leveling by energy storage on the customer's side of the meter were considered. For each of the appliances treated, various energy storage techniques were evaluated by estimating the energy savings and the cost of the required storage system. An estimate of the commercial feasibility of each system was made based on the years necessary to pay back the cost of the storage system. In addition, when alternate approaches could be used to improve the efficiency of the appliance without energy storage, the costs of these methods were considered in the evaluation. The analyses found that the most promising applications involved the use of point-of-use thermal energy storage for electric utility load-leveling. However, although substantial utility operating cost savings can be achieved, there may be little or no actual energy saving when all losses are considered. For applications other than load-leveling, energy savings were too small to pay back the added cost of the storage system in an acceptable time.
Author

N79-32630*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
CHARACTERIZATION OF SOLAR CELLS FOR SPACE APPLICATIONS. VOLUME 8: ELECTRICAL CHARACTERISTICS OF SPECTROLAB BSF, BSR, TEXTURED 290-MICRON SOLAR CELLS (K7) AS A FUNCTION OF INTENSITY, TEMPERATURE AND IRRADIATION
B. E. Anspaugh, D. M. Beckert, R. G. Downing, T. F. Miyahira, and R. S. Weiss 1 Sep. 1979 43 p refs
(Contract NAS7-100)
(NASA-CR-162290; JPL-Pub-78-15-Vol-8) Avail: NTIS HC A03/MF A01 CSCL 10A

A set of parametric data is presented on the Spectrolab textured, back-surface-field, back-surface-reflector solar cell which is a commercially available product. M.M.M.

N79-32631*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
CHARACTERIZATION OF SOLAR CELLS FOR SPACE APPLICATIONS. VOLUME 9: ELECTRICAL CHARACTERISTICS OF SPECTROLAB BSF, TEXTURED, 10-OHM-cM 200-MICRON CELLS AS A FUNCTION OF INTENSITY, TEMPERATURE, AND IRRADIATION
B. E. Anspaugh, D. M. Beckert, R. G. Downing, T. F. Miyahira, and R. S. Weiss 15 Sep. 1979 43 p refs
(Contract NAS7-100)
(NASA-CR-162289; JPL-Pub-78-15-Vol-9) Avail: NTIS HC A03/MF A01 CSCL 10A

Electrical characteristics of textured, back surface field, 10 ohm cm, 200 micron silicon solar cells are presented. A filtered solar simulator was used in order to approximate the spectral distribution of space sunlight. The temperature range covered was from -160 C to 140 C while the solar intensity range covered was 5 mW/sq cm to 250 mW/sq cm. The data were taken at each environment point in the matrix in the form of an I-V curve. A.W.H.

N79-32632*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A PRELIMINARY ASSESSMENT OF SMALL STEAM RANKINE AND BRAYTON POINT-FOCUSING SOLAR MODULES
E. J. Roschke, L. Wen, H. Steele, N. ElGabalawi, and J. Wang 1 Mar. 1979 140 p refs Prepared for DOE
(Contract NAS7-100; JPL Proj. 5104-38)
(NASA-CR-162302; JPL-Pub-79-21; DOE/JPL-1060-16) Avail: NTIS HC A07/MF A01 CSCL 10B

A preliminary assessment of three conceptual point-focusing distributed solar modules is presented. The basic power conversion units consist of small Brayton or Rankine engines individually coupled to two-axis, tracking, point-focusing solar collectors. An array of such modules can be linked together, via electric transport, to form a small power station. Each module also can be utilized on a stand-alone basis, as an individual power source. Author

N79-32633*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
LSA PROJECT TECHNOLOGY DEVELOPMENT UPDATE Low-Cost Solar Array Project
John V. Goldsmith and Donald B. Bickler 30 Aug. 1978 26 p Presented at 10th Project Integration Meeting, Pasadena, Calif., 16-17 Aug. 1978 Prepared for DOE
(Contract NAS7-100; JPL Proj. 5101-104)
(NASA-CR-162301; JPL-Pub-79-26; DOE/JPL-1012-7) Avail: NTIS HC A03/MF A01 CSCL 10A

The state of low cost solar array technology is discussed. The goal of achieving $500/kW by 1986 is also discussed. R.E.S.

N79-32634*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EVALUATION OF CELLULAR GLASSES FOR SOLAR MIRROR PANEL APPLICATIONS Advanced Solar Thermal Technology Project
M. Giovan and M. Adams 15 Jun. 1979 98 p refs Prepared for DOE
(Contract NAS7-100; JPL Proj. 5102-125)
(NASA-CR-162303; JPL-Pub-79-61; DOE/JPL-1060-24) Avail: NTIS HC A05/MF A01 CSCL 10A

An analytic technique was developed to compare the structural and environmental performance of various materials considered for backing of second surface glass solar mirrors. Cellular glass was determined to be a prime candidate due to its low cost, high stiffness-to-weight ratio, thermal expansion match to mirror glass, evident minimal environmental impact and chemical and dimensional stability under conditions of use. The current state of the art and anticipated developments in cellular glass technology are discussed; material properties are correlated to design requirements. A mathematical model is presented which suggests a design approach which allows minimization of life cost; and, a mechanical and environmental testing program is outlined, designed to provide a material property basis for development of cellular glass hardware, together with methodology for collecting lifetime predictive data. Preliminary material property data from measurements are given. Microstructure of several cellular materials is shown, and sensitivity of cellular glass to freeze-thaw degradation and to slow crack growth is discussed. The effect of surface coating is addressed. Author

N79-32635*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RESULTS OF THE 1978 NASA/JPL BALLOON FLIGHT SOLAR CELL CALIBRATION PROGRAM
C. H. Seaman and L. B. Sidwell 1 Sep. 1979 13 p refs
(Contract NAS7-100)
(NASA-CR-162298; JPL-Pub-79-66) Avail: NTIS HC A02/MF A01 CSCL 10A

The 1978 scheduled solar cell calibration balloon flight was successfully completed. Thirty six modules were carried to an altitude of above 36 kilometers. Recovery of telemetry and flight packages was without incident. These calibrated standard cells are used as reference standards in simulator testing of cells and arrays with similar spectral response characteristics. The factors affecting the spectral transmission of the atmosphere at various altitudes are summarized. A.W.H.

N79-32636*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
STIRLING LABORATORY RESEARCH ENGINE SURVEY REPORT
John W. Anderson and Frank W. Hoehn 15 Sep. 1979 77 p refs
(Contract NAS7-100)
(NASA-CR-162304; JPL-Pub-79-86) Avail: NTIS HC A05/MF A01 CSCL 10B

As one step in expanding the knowledge relative to and accelerating the development of Stirling engines, NASA, through the Jet Propulsion Laboratory (JPL), is sponsoring a program which will lead to a versatile Stirling Laboratory Research Engine (SLRE). An objective of this program is to lay the groundwork for a commercial version of this engine. It is important to consider, at an early stage in the engine's development, the needs of the potential users so that the SLRE can support the requirements of educators and researchers in academic, industrial, and government laboratories. For this reason, a survey was performed, the results of which are described. G.Y.

N79-32637*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPARISON OF ALTERNATE FUELS FOR AIRCRAFT
Robert D. Witcofski Sep. 1979 38 p refs Presented at the International DGLR/DFLR Symp. on Hydrogen in Air Transportation, Stuttgart, Germany, 11-14 Sep. 1979
(NASA-TM-80155) Avail: NTIS HC A03/MF A01 CSCL 21D

Liquid hydrogen, liquid methane, and synthetic aviation kerosene were assessed as alternate fuels for aircraft in terms of cost, capital requirements, and energy resource utilization. Fuel transmission and airport storage and distribution facilities are considered. Environmental emissions and safety aspects of fuel selection are discussed and detailed descriptions of various fuel production and liquefaction processes are given. Technological deficiencies are identified. K.L.

N79-32638*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.
CONCEPTUAL DESIGN STUDY OF CONCENTRATOR ENHANCED SOLAR ARRAYS FOR SPACE APPLICATIONS VOLUME 1: STUDY OVERVIEW AND SUMMARY Interim Final Report
15 May 1979 18 p ref
(Contracts NAS7-100; JPL-955194)
(NASA-CR-162328; HAC-REF-E3256-Vol-1) Avail: NTIS

HC A02/MF A01 CSCL 10A

The enhancement of arrays of thin silicon solar cells was studied, including the investigation of thin gallium arsenide cells and conventional thick silicon cells on a rigid substrate. Concentrator concepts employing thin film Kapton mirrors were evaluated for performance in space environments. A.W.H.

N79-32639*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.

CONCEPTUAL DESIGN STUDY OF CONCENTRATOR ENHANCED SOLAR ARRAYS FOR SPACE APPLICATIONS VOLUME 2: TECHNICAL Interim Final Report

15 May 1979 115 p ref

(Contracts NAS7-100; JPL-955194)

(HAC-REF-E3256-VOL-2) Avail: NTIS HC A06/MF A01 CSCL 10A

Concentrator concepts which utilize Kapton mirror material were evaluated and selected for solar array use due to their zero mass. All concepts considered employed thin silicon solar cells. Design requirements for the concentrator were: the cell temperature was not to exceed 150 C; the concentrators were to produce illumination of the array within 15% of being perfectly uniform; the concentrators were to operate while misaligned as much as 5 degrees with the solar axis. Concentrator designs along with mirror structure and configurations are discussed and comparisons are made for optimal space applications. A.W.H.

N79-32640*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SOLAR CELL HIGH EFFICIENCY AND RADIATION DAMAGE, 1979

Aug. 1979 290 p refs Conf. held at Cleveland, 13-14 Jun. 1979

(NASA-CP-2097; D-133) Avail: NTIS HC A13/MF A01 CSCL 10A

Progress in the effort to increase the end-of-life efficiency of solar cells for space use is assessed. Silicon solar cell efficiency, radiation effects, and gallium arsenide cells are emphasized. For individual titles, see N79-32641 through N79-32673.

N79-32641*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE NASA LEWIS RESEARCH CENTER PROGRAM IN SPACE SOLAR CELL RESEARCH AND TECHNOLOGY

Henry W. Brandhorst, Jr. *In its* Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 1-4 (For primary document see N79-32640 23-44)

Avail: NTIS HC A13/MF A01 CSCL 10A

Progress in space solar cell research and technology is reported. An 18 percent-AMO-efficient silicon solar cell, reduction in the radiation damage suffered by silicon solar cells in space, and high efficiency wrap-around contact and thin (50 micrometer) coplanar back contact silicon cells are among the topics discussed. Reduction in the cost of silicon cells for space use, cost effective GaAs solar cells, the feasibility of 30 percent AMO solar energy conversion, and reliable encapsulants for space blankets are also considered. J.M.S.

N79-32642*# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.

SOLAR PHOTOVOLTAIC RESEARCH AND DEVELOPMENT PROGRAM OF THE AIR FORCE AERO PROPULSION LABORATORY

Joseph Wise *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 5-8 (For primary document see N79-32640 23-44)

Avail: NTIS HC A13/MF A01 CSCL 10A

Progress is reported in the following areas: laser weapon effects, solar silicon solar cell concepts, and high voltage hardened, high power system technology. Emphasis is placed on solar cells with increased energy conversion efficiency and radiation resistance characteristics for application to satellite power systems. J.M.S.

N79-32643*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

THE JPL SPACE PHOTOVOLTAIC PROGRAM

John A. Scott-Monck *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 9-12 (For primary document see N79-32640 23-44)

(Contract NAS7-100)

Avail: NTIS HC A13/MF A01 CSCL 10A

The development of energy efficient solar cells for space applications is discussed. The electrical performance of solar cells as a function of temperature and solar intensity and the influence of radiation and subsequent thermal annealing on the electrical behavior of cells are among the factors studied. Progress in GaAs solar cell development is reported with emphasis on improvement of output power and radiation resistance to demonstrate a solar cell array to meet the specific power and stability requirements of solar power satellites. J.M.S.

N79-32644*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

LANGLEY PROGRAM OF GaAs SOLAR CELLS

E. J. Conway *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 13-14 (For primary document see N79-32640 23-44)

Avail: NTIS HC A13/MF A01 CSCL 10A

A brief overview of the development of GaAs solar cell technology is provided. An 18 to 20 percent AMO efficiency, stability under radiation and elevated-temperature operation, and high power-to-weight ratio are among the factors studied. Cell cost and availability are also examined. J.M.S.

N79-32645*# Pennsylvania Univ., Philadelphia.

UPDATING THE LIMIT EFFICIENCY OF SILICON SOLAR CELLS

M. Wolf *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 15-34 refs Sponsored in part by DOE (For primary document see N79-32640 23-44)

(Contract JPL-KM-68903)

Avail: NTIS HC A13/MF A01 CSCL 10A

Evaluation of the limit efficiency based on the simplest, most basic mathematical method that is appropriate for the conditions imposed by the cell model is discussed. The methodology, the solar cell structure, and the selection of the material parameters used in the evaluation are described. The results are discussed including a set of design goals derived from the limit efficiency. J.M.S.

N79-32646*# Comsat Labs., Clarksburg, Md.

LIMITING PROCESS IN SHALLOW JUNCTION SOLAR CELLS

A. Meulenberg and E. Rittner *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 35-36 Submitted for publication (For primary document see N79-32640 23-44)

Avail: NTIS HC A13/MF A01 CSCL 10A

In extending the violet and nonreflective cell technology to lower resistivities, several processes limiting output power were encountered. The most important was the dark diffusion current due to recombination at the front grid contacts. After removal of this problem by reduction of the silicon metal contact area (to 0.14 percent of the total area), the electric field enhanced junction recombination current J sub r was the main limitation. Alteration of the diffusion profile to reduce the junction field is shown to be an effective means of influencing J sub r. The remaining problems are the bulk recombination in the n+ layer and the surface recombination at the oxide-silicon interface; both of these problems are aggravated by band-narrowing resulting from heavy doping in the diffused layer. Experimental evidence for the main limitations is shown, where increased diffusion temperature is seen to reduce both the influence of the front grid contacts and the junction electric field by increasing the junction depth. The potential for further significant improvement in efficiency appears to be high. J.M.S.

N79-32647*# Florida Univ., Gainesville. Dept. of Electrical Engineering.

DESIGN OF HIGH EFFICIENCY HLE SOLAR CELLS FOR SPACE AND TERRESTRIAL APPLICATIONS

A. Neugroschel and F. A. Lindholm *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 37-50 refs (For primary document see N79-32640 23-44)

(Grant NsG-3018)
Avail: NTIS HC A13/MF A01 CSCL 10A

A first-order analysis of HLE cells is presented for both beginning-of-life and end-of-life conditions. Based on this analysis and on experimentally observed values for material parameters. Design approaches for both space and terrestrial cells are presented. The approaches result in specification of doping levels, junction depths, and surface conditions. The proposed structures are projected to have both high V sub OC and high J sub SC. J.M.S.

N79-32648*# Spire Corp., Bedford, Mass.
APPLICATIONS OF ION IMPLANTATION TO HIGH PERFORMANCE, RADIATION TOLERANT SILICON SOLAR CELLS
Allen R. Kirkpatrick, John A. Minnucci, and Keith W. Matthei *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 51-59 refs (For primary document see N79-32640 23-44)
(Contracts NAS3-20823; NAS3-21276)
Avail: NTIS HC A13/MF A01 CSCL 10A

Progress in the development of ion implanted silicon solar cells is reported. Effective back surface preparation by implantation, junction processing to achieve high open circuit voltages in low-resistivity cells, and radiation tolerance cells are among the topics studied. J.M.S.

N79-32649*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OPEN-CIRCUIT VOLTAGE IMPROVEMENTS IN LOW-RESISTIVITY SOLAR CELLS
Michael P. Godlewski, Thomas M. Klucher, George A. Mazaris, and Victor G. Weizer *In its* Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 61-70 refs (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

Mechanisms limiting the open-circuit voltage in 0.1 ohm-cm solar cells were investigated. It was found that a rather complicated multistep diffusion process could produce cells with significantly improved voltages. The voltage capabilities of various laboratory cells were compared independent of their absorption and collection efficiencies. This was accomplished by comparing the cells on the basis of their saturation currents or, equivalently, comparing their voltage outputs at a constant current-density level. The results show that for both the Lewis diffused emitter cell and the Spire ion-implanted emitter cell the base component of the saturation current is voltage controlling. The evidence for the University of Florida cells, although not very conclusive, suggests emitter control of the voltage in this device. The data suggest further that the critical voltage-limiting parameter for the Lewis cell is the electron mobility in the cell base. R.E.S.

N79-32650*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MODELING OF THIN, BACK-WALL SILICON SOLAR CELLS
Cosmo R. Baraona *In its* Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 73-78 refs (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The performance of silicon solar cells with p-n junctions on the nonilluminated surface (i.e., upside-down or back-wall cells) was calculated. These structures consisted of a uniformly shaped p-type substrate layer, a p(+)-type field layer on the front (illuminated) surface, and a shallow, n-type junction on the back (nonilluminated) surface. A four-layer solar cell model was used to calculate efficiency, open-circuit voltage, and short-circuit current. The effect on performance of p-layer thickness and resistivity was determined. The diffusion length was varied to simulate the effect of radiation damage. The results show that peak initial efficiencies greater than 15 percent are possible for cell thicknesses or 100 micrometers or less. After 10 years of radiation damage in geosynchronous orbit, thin (25 to 50 micrometers thick) cells made from 10 to 100 ohm cm material show the smallest decrease (approximately 10 percent) in performance. Author

N79-32651*# Texas Instruments, Inc., Dallas.
DESIGN CONSIDERATIONS FOR THE TANDEM JUNCTION SOLAR CELL
W. T. Matzen, B. G. Carbajal, and R. W. Hardy *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 79-85 refs Sponsored in cooperation with JPL and DOE (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

Structure and operation of the tandem junction cell (TJC) are described. The impact of using only back contacts is discussed. A model is presented which explains operation of the TJC in terms of transistor action. The model is applied to predict TJC performance as a function of physical parameters. Author

N79-32652*# Solarex Corp., Rockville, Md.
THIN CELLS FOR SPACE
G. Storti, J. Wohlgemuth, and C. Wrigley *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 87-95 refs (For primary document see N79-32640 23-44)
(Contracts NAS3-21250; JPL-954883)
Avail: NTIS HC A13/MF A01 CSCL 10A

Research and pilot line production efforts directed towards the fabrication of high efficiency ultrathin silicon solar cells (50 micrometers) are reported. Conventional ultrathin cells with air-mass-zero (AM0) efficiencies exceeding 14% and coplanar back contact cells with AM0 efficiencies up to 11.7% were developed. The primary mechanisms limiting efficiency were determined in both types of cells, and they are discussed within the context of further improving efficiency. Results of pilot line production of conventional ultrathin cells are also presented. Average AM0 efficiencies of 12% were radily achieved for 2000 cell production runs. R.E.S.

N79-32653*# General Electric Co., Schenectady, N. Y.
HIGH EFFICIENCY CELL GEOMETRY
R. N. Hall *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 97-100 (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

A new silicon solar cell is described which has an array of small-area conduction paths to transport current directly through the wafer to metal electrodes on the back. This design eliminates grid shadowing and many of the other losses inherent in conventional cells. Early experimental units without texturing or antireflection coatings show 13.3% efficiency under air-mass-one illumination insolation. Author

N79-32654*# Optical Coating Lab., Inc., City of Industry, Calif.
SILICON SOLAR CELLS FOR SPACE USE: PRESENT PERFORMANCE AND TRENDS
P. A. Iles, F. F. Ho, and S. Khemthong *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 101-104 (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

A technology assessment of present performance levels and current fabrication methods and designs is presented. R.E.S

N79-32655*# Oak Ridge National Lab., Tenn. Solid State Div.
LASER TECHNIQUES IN PHOTOVOLTAIC RESEARCH
R. T. Young, R. F. Wood, R. D. Westbrook, J. Narayan, and C. W. White *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 105-111 refs (For primary document see N79-32640 23-44)
(Contract W-7405-eng-26)
Avail: NTIS HC A13/MF A01 CSCL 10A

High-power laser pulses were used to replace the conventional high temperature furnace processing for the p-n junction formation step in high speed, low cost solar cell fabrication. Three different approaches to junction formation were tested: (1) laser annealing of ion-implanted Si in which laser radiation is used to remove the radiation damage and to recover the electrical activity in the implanted layer; (2) a process in which a thin film of dopant is first deposited on the substrate and then incorporated into the near-surface region by laser-induced diffusion; and (3) a

process in which a heavily doped amorphous silicon layer is deposited on the Si substrate and epitaxially regrown from the melted substrate layer by laser radiation. All three methods were found to provide suitable candidates for high efficiency Si solar cells. R.E.S.

N79-32656*# Naval Research Lab., Washington, D. C.
AN INTERIM REPORT ON THE NTS-2 SOLAR CELL EXPERIMENT
Richard L. Statler and Delores H. Walker *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 117-129 refs Sponsored in part by AFAPL and SAMSO (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

Data obtained from the fourteen solar cell modules on the NTS-2 satellite are presented together with a record of panel temperature and sun inclination. The following flight data are discussed: (1) state of the art solar cell configurations which embody improvements in solar cell efficiency through new silicon surface and bulk technology, (2) improved coverslip materials and coverslip bonding techniques, (3) short and long term effects of ultraviolet rejection filters vs. no filters on the cells, (4) degradation on a developmental type of liquid epitaxy gallium-aluminum-arsenide solar cell, and (5) space radiation effects. R.E.S.

N79-32657*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ELECTRON IRRADIATION OF TANDEM JUNCTION SOLAR CELLS
Bruce E. Anspaugh, Tetsuo F. Miyahira, and John A. Scott-Monck *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 131-136 ref (For primary document see N79-32640 23-44)
(Contract NAS7-100)
Avail: NTIS HC A13/MF A01 CSCL 10A

The electrical behavior of 100 micron thick tandem junction solar cells manufactured by Texas Instruments was studied as a function of 1 MeV electron fluence, photon irradiation, and 60 C annealing. These cells are found to degrade rapidly with radiation, the most serious loss occurring in the blue end of the cell's spectral response. No photon degradation was found to occur, but the cells did anneal a small amount at 60 C. M.M.M.

N79-32658*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RADIATION DAMAGE IN HIGH-VOLTAGE SILICON SOLAR CELLS
Irving Weinberg, Clifford K. Swartz, and Victor G. Weizer *In its* Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 137-143 refs (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

Three types of open circuit high voltage solar cells were tested to determine their performance after exposure to 1 MeV electron irradiations. The cells with a relatively deep n-type emitter were more susceptible to radiation damage than other high open circuit high voltage cells. The use of diffused or ion implanted junctions leads to open circuit high voltage cell designs that are less susceptible to radiation damage. These latter two types of cells show degradations that are typical of the 0.1 ohm-cm material from which they are fabricated. Furthermore, exposure to ionizing radiation causes oxide degradation and decreased cell performance in cells that depend on a charged oxide to achieve significant cell properties. Hence, the combination of a charged oxide and a relatively deep n-type emitter is not recommended for incorporation into a cell designed for use in the particulate radiation environment of space. M.M.M.

N79-32659*# Boeing Aerospace Co., Seattle, Wash.
CO2 LASER ANNEALING OF 50-MICRONS-THICK SILICON SOLAR CELLS
Frank E. Walker *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 145-160 refs (For primary document see N79-32640 23-44)
(Contract NAS9-15636)
Avail: NTIS HC A13/MF A01 CSCL 10A

A test program is conducted to determine thin solar cell annealing effects using a laser energy source. A CO2 continuous-wave laser was used in annealing experiments on 50 micrometers-thick silicon solar cells after proton irradiation. Test cells were irradiated to a fluence of 1.0 x 10 to the 12th power protons/sq cm with 1.9 MeV protons. After irradiation, those cells receiving full proton dosage were degraded by an average of 30% in output power. In annealing tests laser beam exposure times on the solar cell varied from 2 seconds to 16 seconds reaching cell temperatures of from 400 C to 500 C. Under those conditions annealing test results showed recovery in cell output power of from 33% to 90%. M.M.M.

N79-32660*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REVERSE ANNEALING IN RADIATION-DAMAGED, SILICON SOLAR CELLS
Irving Weinberg and Clifford K. Swartz *In its* Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 161-171 refs (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

In order to understand the results in terms of properties of the radiation induced defects, a combination of diffusion length measurements and defect data obtained from Deep Level Transient Spectroscopy were used. The results indicate that the defect at E sub v + 0.30 eV is responsible for the observed reversed annealing. The defect was identified as a boron-oxygen vacancy complex. This identification is a guide to processing efforts aimed at increasing the concentration of these radiation induced defects. M.M.M.

N79-32661*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EFFECT OF DOPANTS ON ANNEALING PERFORMANCE OF SILICON SOLAR CELLS
John A. Scott-Monck and Bruce E. Anspaugh *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 173-183 refs (For primary document see N79-32640 23-44)
(Contract NAS7-100)
Avail: NTIS HC A13/MF A01 CSCL 10A

The optimum annealing parameters of time and temperature for producing cell output recovery were established. Devices made from gallium doped and boron doped silicon were investigated. The cells ranged in resistivity from 0.1 to 20 ohm-cm and in thickness from 50 to 250 micrometers. The observations can be explained in a qualitative manner by postulating a pair of competing mechanisms to account for the low temperature reverse annealing seen in most boron and gallium doped silicon solar cells. Still another mechanism dominates at higher temperatures (350 C and greater) to complete this model. One of the mechanisms, defined as B, allows migrators to couple with radiation induced recombination sites thus increasing or enhancing their capture cross sections. This would tend to reduce minority carrier diffusion length. The new recombination complex is postulated to be thermally stable up to temperatures of approximately 350 C. M.M.M.

N79-32662*# State Univ. of New York at Albany. Inst. for the Study of Defects in Solids.
HIGH-ENERGY ELECTRON-INDUCED DAMAGE PRODUCTION AT ROOM TEMPERATURE IN ALUMINUM-DOPED SILICON
J. W. Corbett, L.-J. Cheng, A. Jaworowski, J. P. Karins, Y. H. Lee, L. Lindstroem (Foersvaret Forskningsanstalt, Stockholm, Sweden), P. M. Mooney (Vassar Coll.), G. Oehrlein, and K. L. Wang (GE Co., Schenectady, N. Y.) *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 185-196 refs (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

DLTS and EPR measurements are reported on aluminum-doped silicon that was irradiated at room temperature with high-energy electrons. Comparisons are made to comparable experiments on boron-doped silicon. Many of the same defects observed in boron-doped silicon are also observed in aluminum-doped silicon, but several others were not observed, including the aluminum interstitial and aluminum-associated defects. Damage production modeling, including the dependence on aluminum concentration, is presented. M.M.M.

N79-32663*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RADIATION DAMAGE IN GaAs SOLAR CELLS
E. J. Conway and G. H. Walker *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 201-207 refs (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

Recent results of electron and proton irradiation and annealing of GaAs solar cells are presented along with some implications of these results. A comparison between the energy-levels produced by protons and by electrons which are not stopped in the material indicate that the damage produced by protons and electrons may be qualitatively different. Thus, annealing of proton damage may be very different from the annealing of electron damage. M.M.M.

N79-32664*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
FABRICATION OF HIGH EFFICIENCY AND RADIATION RESISTANT GaAs SOLAR CELLS
S. Kamath, R. C. Knechtli, R. Loo, and Bruce E. Anspaugh *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 209-216 Prepared in cooperation with Hughes Res. Labs., Malibu, Calif. (For primary document see N79-32640 23-44)
(Contracts NAS1-14727; F33615-77-C-3150)
Avail: NTIS HC A13/MF A01 CSCL 10A

Systematic improvements in fabrication yield were obtained by appropriate control of the liquid phase epitaxial growth process, contact fabrication and surface preparation. To improve radiation hardness, the junction depth was decreased while overcoming the penalty in decreased solar cell efficiency which tends to go hand-in-hand with the reduction of junction depth in (AlGa) As-GaAs solar cells. Cells were made with an AMO efficiency of 18% and a junction depth of 0.5 micrometers, as compared to junction depths on the order of 1.0 micrometers. With respect to the damage caused by proton irradiation, the nature of the observed damage was correlated to the energy and penetration depth of the damaging protons. M.M.M.

N79-32665*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEMPERATURE AND INTENSITY DEPENDENCE OF THE PERFORMANCE OF AN ELECTRON-IRRADIATED (AlGa)As/GaAs SOLAR CELL
Clifford K. Swartz and Russell E. Hart, Jr. *In its* Solar Cell High Frequency and Radiation Damage, 1979 Aug. 1979 p 217-226 refs (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The performance of a Hughes, liquid-phase epitaxial 2 centimeter-by-2 centimeter, (AlGa)As/GaAs solar cell was measured before and after irradiations with 1 MeV electrons to fluences of 1 x 10 to the 16th power electrons/sq cm. The temperature dependence of performance was measured over the temperature range 135 to 415 K at each fluence level. In addition, temperature dependences were measured at five intensity levels from 137 to 2.57 mW/sq cm before irradiation and after a fluence of 1 x 10 to the 16th power electrons/sq cm. For the intermediate fluences, performance was measured as a function of intensity at 298 K only. G.Y.

N79-32666*# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SHALLOW-HOMOJUNCTION GaAs SOLAR CELLS
John C. C. Fan *In* NASA. Lewis Res. Center Solar Cell High Frequency and Radiation Damage, 1979 Aug. 1979 p 227-233 refs Sponsored in part by AF (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

Single-crystal GaAs shallow-homojunction solar cells on GaAs or Ge substrates, without Ga sub 1-x Al sub x As window layers, that have conversion efficiencies exceeding 20% at AM1 (17% at AMO). Using a simple theoretical model, good fits were obtained between computer calculations and experimental data for external quantum efficiency and conversion efficiency of cells with different values of n+ layer thickness. The calculations not only yield values for material properties of the GaAs layers composing the cells but will also permit the optimization of cell designs for space and terrestrial applications. Preliminary measurements indicate that the shallow-homojunction cells are resistant to electron irradiation. In the best test so far, bombardment with 1 x 10 to the 16th power/sq cm fluence of 1 MeV electrons reduced the short-circuit current by only about 6%. G.Y.

N79-32667*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RADIATION EFFECTS IN GaAs AMOS SOLAR CELLS
B. K. Shin and R. J. Stirn *In* NASA. Lewis Res. Center Solar Cell High Frequency and Radiation Damage, 1979 Aug. 1979 p 235-244 refs (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The results of radiation damage produced in AMOS (Antireflecting-Metal-Oxide-Semiconductor) cells with Sb2O3 interfacial oxide layers by 1-MeV electrons are presented. The degradation properties of the cells as a function of irradiation fluences were correlated with the changes in their spectral response, C-V, dark forward, and light I-V characteristics. The active n-type GaAs layers were grown by the OM-CVD technique, using sulfur doping in the range between 3 x 10 to the 15th power and 7 x 10 to the 16th power/cu cm. At a fluence of 10 to the 16th power e/sq cm, the low-doped samples showed I sub sc degradation of 8% and V sub oc degradation of 8%. The high-doped samples showed I sub sc and V sub oc degradation of 32% and 1%, respectively, while the fill factor remained relatively unchanged for both. AMOS cells with water vapor-grown interfacial layers showed no significant change in V sub oc. G.Y.

N79-32668*# Brown Univ., Providence, R. I.
CAPACITANCE TRANSIENTS IN p-TYPE GaAs MOS STRUCTURES AND APPLICATION TO LIFETIME MAPPING DURING SOLAR CELL FABRICATION
G. Vitale, J. J. Loferski, and Y. Ercil *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 245-251 refs Sponsored in part by NSF (For primary document see N79-32640 23-44)
(Contracts EG-77-C-03-1579; EG-77-C-03-1712)
Avail: NTIS HC A13/MF A01 CSCL 10A

Fabrication on p-type GaAs of MOS structures in which the quality of the oxide is such that the surface can be driven into deep inversion by a voltage pulse is reported. The capacitance transients in such MOS capacitors as a function of step amplitude and temperature were measured and the transients were analyzed by an extension of a method for silicon. The oxides were produced by plasma oxidation on an LPE-grown p-type GaAs specimen with N sub A of 3x10 to the 17th power/cu cm. The capacitors were produced by depositing 50 microns-diameter gold dots over the native oxide and, therefore, the lifetime is localized to the area under the dot. The method permits extraction of both the bulk lifetime and the interface recombination velocity. These parameters on samples with different N sub A were measured and a correlation between tau sub g and N sub A was found. G.Y.

N79-32669*# Hughes Research Labs., Malibu, Calif.
SUMMARY OF GaAs SOLAR CELL PERFORMANCE AND RADIATION DAMAGE WORKSHOP
G. S. Kamath *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 253-254 (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The workshop considered the GaAs solar cell capability and promise in several steps: (1) maximum efficiency; (2) space application; (3) major technology problems (AR coating optimization, contacts); (4) radiation resistance; (5) cost and availability; and (6) alternatives. The workshop believes that GaAs solar cells are fast approaching the fulfillment of their potential as candidates for space cells. A maximum efficiency of 20 to 31 percent AMO can be reasonably expected from GaAs based cells, and this may go a little higher with concentration. The use of concentration in space needs to be more carefully evaluated. G.Y.

N79-32670*# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
A REVIEW OF AIR FORCE HIGH EFFICIENCY CASCADED MULTIPLE BANDGAP SOLAR CELL RESEARCH AND

DEVELOPMENT
W. P. Rahilly *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 255-261 refs (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

At the time of their conception, the cell stack systems to be discussed represent the best semiconductor materials combinations to achieve Air Force program goals. These systems are investigated thoroughly and the most promising systems, from the standpoint of high efficiency, are taken for further development with large area emphasized (at least 4 sq cm). The emphasis in the Air Force cascaded cell program is placed on eventual nonconcentrator application. This use of the final cell design considerably relieves the low resistance requirements for the tunnel junction. In a high concentration application the voltage drop across the tunnel junction can be a very serious problem. G.Y.

N79-32671*# Bureau of Mines, Washington, D. C.
EFFICIENCY OF TANDEM SOLAR CELL SYSTEMS AS FUNCTION OF TEMPERATURE AND SOLAR ENERGY CONCENTRATION RATIO
N. A. Gokcen and J. J. Loferski (Brown Univ.) *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 263-265 (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The results of a comprehensive theoretical analysis of tandem photovoltaic solar cells as a function of temperature and solar concentration ratio are presented. The overall efficiencies of tandem cell stacks consisting of as many as 24 cells having gaps in the 0.7 to 3.6 eV range were calculated for temperatures of 200, 300, 400, and 500 K and for illumination by an AMO solar spectrum having concentration ratios of 1, 100, 500, and 1000 suns. For ideal diodes (A = B = 1), the calculations show that the optimized overall efficiency has a limiting value eta sub opt of approximately 70 percent for T = 200 K and C = 1000; for T = 300 K and C = 1000, this limiting efficiency approaches 60 percent. G.Y.

N79-32672*# Research Triangle Inst., Research Triangle Park, N. C.
COMPUTER MODELING OF A TWO-JUNCTION, MONOLITHIC CASCADE SOLAR CELL
M. F. Lamorte and D. Abbott *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 267-281 refs Sponsored in cooperation with AFAL, DOE and Sandia Labs., Albuquerque, N. Mex. (For primary document see N79-32640 23-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The theory and design criteria for monolithic, two-junction cascade solar cells are described. The departure from the conventional solar cell analytical method and the reasons for using the integral form of the continuity equations are briefly discussed. The results of design optimization are presented. The energy conversion efficiency that is predicted for the optimized structure is greater than 30% at 300 K, AMO and one sun. The analytical method predicts device performance characteristics as a function of temperature. The range is restricted to 300 to 600 K. While the analysis is capable of determining most of the physical processes occurring in each of the individual layers, only the more significant device performance characteristics are presented. Author

N79-32673*# Rockwell International Corp., Thousand Oaks, Calif. Electronics Research Center.
INTERCELL OHMIC CONTACTS FOR HIGH EFFICIENCY MULTIJUNCTION SOLAR CONVERTERS
Stanley W. Zehr, D. L. Miller, and J. S. Harris, Jr. *In* NASA. Lewis Res. Center Solar Cell High Efficiency and Radiation Damage, 1979 Aug. 1979 p 283-291 refs (For primary document see N79-32640 23-44)
(Contract F33615-78-C-2036)
Avail: NTIS HC A13/MF A01 CSCL 10A

The monolithic multijunction converter is an attractive approach to achieving solar/electric conversion with greater than 30% efficiency. A major technical challenge in the development of such devices is the requirement for low resistance, optically transparent intercell contacts between adjacent junctions. These contacts should transmit, without significant loss, the spectral fraction of the incident sunlight which is not absorbed and converted in the overlying junction materials. Their contact resistances must be low enough to prevent significant I to the 2d power R loss at the designed current density levels. They should also exhibit adequate thermal conductivity to prevent device overheating when subjected to the designed illumination level. Recent encouraging results for the development of such contacts are presented. G.Y.

N79-32674# Johns-Manville Sales Corp., Denver, Colo. Research and Development Center.
PERFORMANCE EVALUATION OF SOLAR FILMS AND SCREENS Final Report, 6 Jun. - Sep. 1978
Apr. 1979 71 p refs
(Contract DAAK70-78-D-0002)
(AD-A070039; USAFESA-TSD-2060) Avail: NTIS HC A04/MF A01 CSCL 13/1

The use of solar films and screens to reduce energy usage is surveyed by means of Market and Literature Surveys that provide basic information on the availability, manufacture, function, cost, and solar optical properties of solar films and screens. A simplified method of determining potential energy savings is given in a step by step format that includes consideration of solar heat gain, heat loss, and daylighting aspects of the application of solar films and screens. This simplified hand calculation procedure should provide an interim means of providing the energy saving information required by the Energy Conservation Investment Program. More sophisticated methods of calculation are under development by the Lawrence Berkeley Laboratory under a contract with the Department of Energy. This computer model technique combined with empirical data should be available by mid to end of year 1979. Author (GRA)

N79-32675# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
COMPUTERIZED PATTERN RECOGNITION APPLIED TO Ni-Cd CELL LIFETIME PREDICTION Interim Report
W. Arthur Byers and S. P. Perone Aug. 1978 25 p refs Submitted for publication
(Contract N00014-77-C-0353; NR Proj. 359-650)
(AD-A070344; TR-1) Avail: NTIS HC A02/MF A01 CSCL 10/3

Computerized pattern recognition was used to look for characteristics of new nickel-cadmium spacecraft cells which would be predictive of later performance under stressful conditions. It was found that the changes in voltage while a cell was being charged could be used to make a rough estimate of its lifetime. The standard deviation in the predicted lifetime values was somewhat smaller than the standard deviation of the lifetime distribution as a whole, and there are indications that a more extensive data set would yield better results. GRA

N79-32676# Naval Surface Weapons Center, White Oak, Md.
TEMPERATURE PROFILE IN Li/So2 CELLS DURING DISCHARGE
S. Dallek, R. F. Bis, and F. M. Bowers 15 Dec. 1978 29 p refs
(AD-A070378; NSWC/WOL/TR-78-213) Avail: NTIS HC A03/MF A01 CSCL 10/3

Li/SO2 cells have been discharged at various rates to study the distribution of heat within the cells and to determine the conditions under which Li/SO2 batteries may be safely used by the Navy. GRA

N79-32677# Oak Ridge National Lab., Tenn.
DECENTRALIZED SOLAR ENERGY TECHNOLOGY ASSESSMENT PROGRAM: RESEARCH PLAN
B. H. Bronfman, M. Schweitzer, S. A. Carnes, E. Peelle, G. Samuels, Jr., and T. J. Wilbanks May 1979 53 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6913) Avail: NTIS HC A04/MF A01

The social, political, institutional and life-style impacts of the widespread adoption of decentralized solar technology are assessed. The major components are described and the research plan for the Technology Assessment Program is presented.

Responsibilities, milestones and deliverables for all components are identified where applicable. DOE

N79-32678# Los Alamos Scientific Lab., N. Mex.
ENERGY EXTRACTION OPERATIONS: SOME PRELIMINARY RESULTS
R. H. Hendron 1979 10 p refs Presented at 3d US Natl. Congr. on Pressure Vessels and Piping, San Francisco, 25 Jun. 1979
(Contract W-7405-eng-36)
(LA-UR-79-679; Conf-790615-10) Avail: NTIS HC A02/MF A01

Thermal energy was extracted from Precambrian granitic rock by injection and circulating water through fractured zones or reservoirs. Two boreholes were drilled to depths of about 3 km (10,000 ft) in a location selected for high heat flow and an apparent lack of faulting. Bottom-hole temperature was 205 C (400 F). The holes were connected at depth by hydraulic fracturing to form a flow path and heat extraction surface. Energy has been extracted at rates exceeding 5 MW(t) in three operations totaling 2847 h. These operations are summarized. DOE

N79-32679# Los Alamos Scientific Lab., N. Mex.
THE FUTURE OF HOT DRY ROCK GEOTHERMAL ENERGY SYSTEMS
Morton C. Smith 1979 13 p refs Presented at 3d US Natl. Congr. on Pressure Vessels and Piping, San Francisco, 25 Jun. 1979
(Contract W-7405-eng-36)
(LA-UR-79-683; Conf-790615-12) Avail: NTIS HC A02/MF A01

The magnitude and distribution of hot dry rock and the variety of possible heat extraction techniques were studied. It is concluded that this energy supply can eventually be used on a large scale. DOE

N79-32680# Mound Lab., Miamisburg, Ohio.
EVALUATION OF A LARGE NONCONVECTIVE SOLAR POND
Layton J. Wittenberg and Marc J. Harris 1979 12 p refs Presented at the Solar Energy Storage Options Workshop, San Antonio, 18 Mar. 1979
(Contract EY-76-C-04-0053)
(MLM-2606(OP); Conf-790328-2) Avail: NTIS HC A02/MF A01

The operational performance of one of the largest functional, salt-gradient solar ponds in the world is evaluated. This solar pond was constructed by the City of Miamisburg on property adjacent to the Mound Facility. Data are collected on the annual thermal cycle characteristics of this combined solar energy collector and thermal storage system, and system performance is evaluated based upon models developed at several university research ponds. DOE

N79-32681# Sandia Labs., Albuquerque, N. Mex. Experimental Systems Operations Div.
PERFORMANCE TESTING OF THE DEL CONCENTRATING SOLAR COLLECTOR
Vernon E. Dudley (Edgerton, Germeshausen and Grier, Inc., Albuquerque, N. Mex.) and Robert M. Workhoven Apr. 1979 28 p refs
(Contract EY-76-C-04-0789)
(SAND-79-0515) Avail: NTIS HC A03/MF A01

The results of tests performed on the Del Solar Collector at the Midtemperature Solar Systems Test Facility are summarized. Test objectives are defined, test procedures are described, and test results and conclusions are given. DOE

N79-32682# Colorado State Univ., Fort Collins. Solar Energy Applications Lab.
STRATIFIED THERMAL STORAGE IN RESIDENTIAL SOLAR ENERGY APPLICATIONS
M. K. Sharp and R. I. Lohrke Washington DOE Jun. 1978 64 p refs
(Contract EG-77-S-02-4523; N68305-76-0036)
(COO-4523-1) Avail: NTIS HC A04/MF A01

The benefits of thermal stratification in sensible heat storage were investigated for several residential solar applications. The operation of space heating, air conditioning and water heating systems with water storage was simulated on a computer. The performance of comparable systems with mixed and stratified storage was determined in terms of the fraction of the total load supplied by solar energy. The effects of design parameters such as collector efficiency, storage volume, tank geometry, etc., on the relative advantage of stratified over well-mixed storage were assessed. DOE

N79-32683# Sandia Labs., Albuquerque, N. Mex.
CORROSION IN MOLTEN SALTS USED FOR SOLAR THERMAL STORAGE APPLICATIONS
William H. Smyrl 1978 12 p refs Presented at the Reliability of Mater. Workshop, Denver, 18 Dec. 1978
(Contract EY-76-C-04-0789)
(SAND-79-0246C; Conf-781228-1) Avail: NTIS HC A02/MF A01

Some of the broad outlines of corrosion behavior are discussed. The compatibility of materials with the molten nitrate-nitrite class of salts selected for solar thermal storage applications is discussed at some length. A brief summary is given of recommendations for areas of future work on these salts to increase the reliability of materials behaviors in solar systems. Author (DOE)

N79-32684# California Univ., Berkeley. Lawrence Berkeley Lab.
DESCRIPTION OF THE 3-DIMENSIONAL 2-PHASE SIMULATOR SHAFT78 FOR USE IN GEOTHERMAL RESERVOIR STUDIES
Karsten Pruess, J. Mike Zerzan, Ron C. Schroeder, and Paul A. Witherspoon Jan. 1979 17 p refs Presented at the 5th Symp. on Reservoir Simulation, Denver, 31 Jan. 1979
(Contract W-7405-eng-48)
(LBL-8802; Conf-790119-2) Avail: NTIS HC A02/MF A01

The algorithm of SHAFT78, based on mass and energy balance equations for two phase flow in a porous medium, is described with emphasis on its application to geothermal reservoir studies. Finite difference equations are obtained by integrating the basic partial differential equations for mass and energy flow over arbitrary polyhedral volume elements; regular and irregular reservoir shapes are handled with the same ease. The equations are solved semi-implicitly for discrete time steps and the coupling between mass and energy flow is treated in a noniterative way. Results of calculations for idealized systems which verify the program and give insight into the pressure response of two phase reservoirs during production are discussed. DOE

N79-32685# Brown Univ., Providence, R. I. Engineering Div.
AVAILABLE WORK IN GEOTHERMAL ENERGY
Joseph Kestin Jul. 1978 95 p refs
(Contract EY-76-S-02-4051)
(COO-4051-25) Avail: NTIS HC A05/MF A01

The most important thermodynamic considerations needed for a clear understanding of the operation of geothermal installations used for the production of electricity are presented. A brief description is given of the nature of a geothermal reservoir and the characteristics of the most practical systems for the conversion of geothermal energy into work are described. The shortcomings of the method of cycle analysis are discussed when applied to geothermal plants. Special attention is devoted to a detailed discussion of the most important general indicators that follow for the designer from a thermodynamic analysis. Various methods of graphically interpreting the concept of available work are described in detail and the importance of easily accessible, reliable formulations of the thermophysical properties of the pure substances, solutions, and mixtures that the designer needs for success are discussed. DOE

N79-32686# University of Southeastern Massachusetts, North Dartmouth.
GEOTHERMAL POWER PLANTS OF THE SOVIET UNION. A TECHNICAL SURVEY OF EXISTING AND PLANNED INSTALLATIONS
R DiPippo Jan. 1979 25 p refs Prepared in cooperation with Brown Univ.
(Contract EY-76-S-02-4051)
(COO-4051-41) Avail: NTIS HC A02/MF A01

Some of the geothermal areas in the Soviet Union which

may support electric generating stations are described. The plants at Pauzhetka (single-flash steam), at Paratunka (Freon binary), and at Bolshoye-Bannoye (multi-flash steam) are described in technical detail. The reference list contains some of the most recent sources of information on geothermal power plant developments in the Soviet Union. DOE

N79-32687# Aerospace Corp., El Segundo, Calif.
SOLAR HEATING AND COOLING OF BUILDINGS (SHACOB): REQUIREMENTS DEFINITION AND IMPACT ANALYSIS
C. K. Cretcher and W. C. Melton Jun. 1978 82 p refs Sponsored by Elec. Power Res. Inst.
(EPRI Proj. 553)
(EPRI-ER-808-SY) Avail: NTIS HC A05/MF A01

The economic impact of various (SHACOB) design concepts on the electric utilities and their customers was assessed along with system requirements for optimizing this impact. Weather and insolation inputs for simulations were established for locations across the United States. Reference buildings and their thermal properties were defined, and detailed internal and external load models generated to characterize building thermal performance. Both solar and conventional systems, including load management systems featuring nighttime thermal storage were simulated. The systems analyzed in detail were direct solar systems with and without a load management capability, solar assisted heat pumps, and customer load management systems. These systems were evaluated with respect to conventional resistive and heat pump systems. Projections for buildings and types of heating system installations in those buildings were developed by eight participating utilities for their own service areas. DOE

N79-32688# Midwest Research Inst., Golden, Colo.
SOLAR THERMAL TEST FACILITIES USERS ASSOCIATION
C. J. Bishop Jan. 1979 54 p refs
(Contract EG-77-C-01-4042)
(SERI/PR-13-154) Avail: NTIS HC A04/MF A01

The current status and needs of high temperature research is summarized along with some of the experiments which might be undertaken in the solar thermal test facilities (STTF). The use of high temperatures for industrial processes is also reviewed. Proposals received and reviewed by the STTF Users Association are included. Operation of the STTFUA is described with emphasis on dissemination of information on the STTF through conferences, workshops, and newsletters. J.M.S.

N79-32689# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SOLAR REPOWERING WORKSHOP Summary Report
D. Nordman 2 Aug. 1978 31 p Presented at Workshop on Solar Repowering, Denver, 2 Aug. 1978
(Contract EG-77-C-01-4042)
(SERI/TP-35-57; Conf-780894-Summ) Avail: NTIS HC A03/MF A01

The demand for solar thermal technologies is discussed along with the key issues in the supply of solar thermal technologies. Discussion questions are listed and the responses are summarized. DOE

N79-32690# Los Alamos Scientific Lab., N. Mex.
FEDERAL HOT DRY ROCK GEOTHERMAL ENERGY DEVELOPMENT PROGRAM: AN OVERVIEW
Gregory J. Nunz 1979 8 p refs Presented at 3d US Natl. Congr. on Pressure Vessels and Piping, San Francisco, 25 Jun. 1979
(Contract W-7405-eng-36)
(LA-UR-79-670; Conf-790615-9) Avail: NTIS HC A02/MF A01

The formulation and evolution of the Federal hot dry rock geothermal energy development program were traced. Accomplishments to date, including the establishment and evaluation of the 5 MW sub t phase one reservoir at Fenton Hill, N.M. and various instrument and equipment developments, are discussed. Future plans presented include (1) establishment of a 20 to 50 MW sub t phase 2 reservoir at Fenton Hill that will be used to demonstrate longevity and, eventually, electric power production and (2) the selection of a second site at which a direct thermal application will be demonstrated. DOE

N79-32691# Arizona State Univ., Tempe.
COMBINED PHOTOVOLTAIC/THERMAL SYSTEM STUDIES
D. L. Evans, W. A. Facinelli, and R. T. Otterbein Aug. 1978 183 p refs
(Contract EY-76-C-04-0789)
(SAND-78-7031) Avail: NTIS HC A09/MF A01

Modelling of concentrating combined collectors (those that produce both electricity from solar cells as well as thermal energy from the sun's rays) is discussed. Particular attention is devoted to accurately modelling the IV curves of present day 2 x 2 cm silicon cells designed for concentration. Also discussed is modelling of storage batteries, regulators and inverters all of which are usually found in photovoltaic systems. The models devised were formalized in subroutines that are compatible with TRNSYS. Some preliminary systems studies for both constant collector inlet fluid temperature and floating temperature systems are reported. DOE

N79-32692# Battelle Pacific Northwest Labs., Richland, Wash.
SYSTEMS ANALYSIS OF SOLAR THERMAL POWER SYSTEMS. REPORT ON TASK 1: DETERMINATION AND CHARACTERIZATION OF SOLAR THERMAL CONVERSION OPTIONS
W. J. Apley Jul. 1978 65 p
(Contract EY-76-C-06-1830)
(PNL-2693) Avail: NTIS HC A04/MF A01

Seven general solar thermal conversion concepts were selected initially. The literature review confirmed that these are the only concepts that are developed to a level suitable for inclusion in the comparative analysis to be performed. A summary of information pertaining to these concepts is given and the concepts are briefly described. The seven concepts are: point-focusing distributed receiver system; point focusing, central receiver systems; fixed mirror/distributed focus system; line-focus central receiver system; line-focus distributed receiver system; fixed mirror line-focus distributed receiver system, and low concentrator non-tracking systems. Author (DOE)

N79-32693# California Univ., Livermore. Lawrence Livermore Lab.
PERFORMANCE TESTS OF THE RADIAL OUTFLOW REACTION TURBINE FOR GEOTHERMAL APPLICATIONS
P. A. House 21 Aug. 1978 11 p refs
(Contract W-7405-eng-48)
(UCID-17902) Avail: NTIS HC A02/MF A01

A pure reaction turbine, for geothermal applications, was developed. This radial outflow reaction turbine is designed specifically to produce power from the expansion of saturated or compressed liquid at temperatures of less than 180 C. In the tests reported here the highest efficiency measured was 32.7%, clearly below the peak efficiency for this small machine. Extrapolations to larger machines indicate that an efficiency near 50% is a credible goal, an attractive performance as either a total flow expander for liquid or in conjunction with conventional flashed steam systems. The development and proof of feasiblity of efficient liquid expanders broadens the opportunities for economic power production from lower temperature geothermal resources, and possibly utilization of waste heat in industrial processes. DOE

N79-32694# Sandia Labs., Albuquerque, N. Mex. Solar Project Div.
THERMAL ENERGY STORAGE FOR ADVANCED SOLAR CENTRAL RECEIVER POWER SYSTEMS
L. G. Radosevich Aug. 1978 35 p refs
(Contract EY-76-C-04-0789)
(SAND-78-8221) Avail: NTIS HC A03/MF A01

Thermal energy storage is used in the advanced solar central receiver power systems currently being studied under Department of Energy sponsorship. The following are described: (1) the storage operating requirements imposed by interface constraints between energy storage and the receiver and electrical power generation systems; (2) several storage concept candidates which may meet these requirements; (3) potential cost differences between each

of the storage concepts; and (4) the technical uncertainties associated with each storage concept. DOE

N79-32695# California Univ., Livermore. Lawrence Livermore Lab.
DEMONSTRATION OF THE CAPABILITIES OF THE LIVERMORE ENERGY POLICY MODEL
S. S. Sussman and W. F. Rousseau Jul. 1978 34 p refs
(Contract W-7405-eng-48)
(UCRL-52508) Avail: NTIS HC A03/MF A01

A computer tool is described which can analyze, within the framework of a general equilibrium model, the potential economic effects of government policies that alter free-market equilibrium in the energy sector. Aspects of the model discussed are the specification of input data and output formats, and the use of a new language for defining the energy network and data. DOE

N79-32696# Department of Energy, Washington, D. C.
FOSSIL ENERGY PROGRAM SUMMARY DOCUMENT
Mar. 1979 484 p refs
(DOE/ET-0087) Avail: NTIS HC A21/MF A01

The programs and projects involving the fossil energy resources of the United States (coal, petroleum, natural gas, and oil shales) are described in detail. Commercialization, environmental, and socio-economic issues involved in these activities are of prime consideration. The contributions of the energy technology centers and national laboratories to the overall goals of the Fossil Energy Program are summarized. International programs on the production and utilization of fossil fuels are described. The requested funding for FY 1980 is $747.6 million, of which $662.7 million is planned for coal, $57.4 million for petroleum, and $27.6 million for gas. DOE

N79-32697# Argonne National Lab., Ill.
ENERGY AND COST CALCULATIONS. 1: OPTIMIZATION OF ELECTROCHEMICAL PROCESSES TO ACHIEVE MINIMUM PRODUCT COST AND THE IMPACT ON ENERGY CONSUMPTION
R. Keller Apr. 1979 49 p refs
(Contract W-31-109-eng-38)
(ANL/OEPM-78-2) Avail: NTIS HC A03/MF A01

In industrial electrochemical processes, the cost resulting from energy consumption and other costs are optimized by operating at an optimum current density. The interrelationships between process operating conditions, product cost, and energy consumption were studied by means of model calculations. The effect of changes in energy price and of process improvements was estimated; the energy consumption of new, undeveloped processes was predicted; and electrolytic processes to produce aluminum, chlor-alkali electrolysis, and copper refining were examined. DOE

N79-32698# Los Alamos Scientific Lab., N. Mex.
POTENTIAL PREDICTION NEEDS IN SUPPORT OF ENERGY SYSTEMS
R. L. Blake 1979 7 p refs Presented at Intern. Solar-Terrestrial Predictions Workshop, Boulder, Colo., 23 Apr. 1979
(Contract W-7405-eng-36)
(LA-UR-79-673; Conf-790413-3) Avail: NTIS HC A02/MF A01

Examples are given to show that energy systems are tied to global solar-terrestrial processes. The need for long term basic research on the solar-terrestrial system is emphasized. DOE

N79-32699*# PRC Energy Analysis Co., McLean, Va.
ECONOMIC AND DEMOGRAPHIC ISSUES RELATED TO DEPLOYMENT OF THE SATELLITE POWER SYSTEM (SPS)
Thomas E. Baldwin, Lawrence G. Hill, Danilo J. Santini, and Erik J. Stenehjem Oct. 1978 71 p refs Sponsored in part by NASA
(Contract W-31-109-eng-38)
(NASA-CR-158886; ANL/EES/TM-23) Avail: NTIS HC A04/MF A01 CSCL 10B

Growth in energy consumption stimulated interest in exploitation of renewable sources of electric energy. One technology that was proposed is the Satellite Power System (SPS). Before committing the U.S. to such a large program, the Department of Energy and the National Aeronautics and Space Administration are jointly participating in an SPS Concept Development and Evaluation Program. This white paper on industrial and population relocation is part of the FY 78 preliminary evaluation of related socio-economic issues. Results of four preliminary assessment activities are documented. DOE

N79-32700# Lincoln Lab., Mass. Inst. of Tech., Lexington.
FIELD TESTS OF PHOTOVOLTAIC POWER SYSTEMS
M. D. Pope and R. W. Matlin 1979 10 p refs Presented at the ASME Gas Turbine Closed-Cycle Session, San Diego, 11 Mar. 1979
(Contract EY-76-C-02-4094)
(COO-4094-32; Conf-790305-5) Avail: NTIS HC A02/MF A01

Field test experience gained at existing photovoltaic test sites is discussed. These sites include a 25 kW peak power system at Mead, Nebraska, a 12 kW peak array at MIT/Lincoln Laboratory, a 1.6 kW peak PV power system at the Chicago Museum of Science and Industry, and several small (approximately 100 watts peak) arrays located in various urban and rural sites. Data are given on failures which have occurred in the field and on the frequency of unscheduled outages. Also, information is presented concerning the environmental extremes to which the systems have been exposed. Operating experience gained from these projects is discussed in the contexts of storage, reliability, safety and cost. Finally, some projects which are currently in the design are discussed. DOE

N79-32701# Lockheed Missiles and Space Co., Palo Alto, Calif. Electro-Optics Lab.
CADMIUM SULFIDE-COPPER SULFIDE HETEROJUNCTION CELL RESEARCH Technical Progress Report, 1 Mar. 1978 - 31 May 1978
30 Jun. 1978 37 p
(Contract EG-77-C-03-1459)
(SAN-1459-3; LMSC-D626523; TPR-3) Avail: NTIS HC A03/MF A01

The program objective is to investigate and evaluate the application of cylindrical-post magnetron reactive sputtering to the production of solar cell quality thin films of CdS/Cu2S for large scale terrestrial photovoltaic energy conversion. Cominco American has encountered difficulties in maintaining the desired 6-9's purity while casting Cd, Cd-Zn, and Zn sputtering targets over the nickelplated copper mandrels which are used to provide strength to the overall assembly. A major activity has been a systematic study of Cu/sub x/S coatings deposited by reactive sputtering Cu in Ar-H2S gas mixtures at various injection rates (partial pressures) of H2S. The coatings were deposited on borosilicate glass substrates at substrate temperatures of about 35 C and 130 C. The coatings were analyzed with respect to electrical, optical, and structural characteristics. Van der Pauw and temperature dependence of resistivity measurements were made on selected films. Optical constants were obtained from transmission and reflection measurements. Structural and compositional measurements were made using X-ray diffraction, scanning electron microscopy, microprobe, and X-ray energy spectroscopy. DOE

N79-32702# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MICROPROCESSOR-CONTROLLED AUTONOMOUS SUN-FOLLOWING MOUNT FOR SOLAR PHOTOVOLTAIC ENERGY PLANNING
Carl H. Much, Peter L. Rossini, and David G. Stuart 1979 6 p refs Presented at the IECI 1979 Conf. on Ind. Appl. of Microprocessors, Philadelphia, 19-21 Mar. 1979
(Contract EY-76-C-02-4094)
(COO-4094-34; Conf-790353-2) Avail: NTIS HC A02/MF A01

A sun-following pyroheliometer mount and control system for support of a solar photovoltaic energy program was designed. The system features the use of a microprocessor for controlling the mount and handling complex control functions required by variations in the motion of the sun. The system is a stand-alone, unattended system with capabilities for remote diagnosis by telephone. DOE

N79-32703# Sandia Labs., Albuquerque, N. Mex.
HELIOSTAT BEAM CHARACTERIZATION SYSTEM
E. Don Thalhammer and Gary S. Phipps 1979 37 p refs

Presented at the 25th ISA Intern. Instr. Symp., Anaheim, Calif., 7 May 1979
(Contract EY-76-C-04-0789)
(SAND-79-0697C; Conf-790505-10) Avail: NTIS HC A03/MF A01

The beam characterization system utilizes video radiometer techniques to quantitatively describe the solar energy projected by a heliostat. This system is designed to evaluate prototype heliostats and to improve the performance of the Central Receiver Test Facility heliostats. The system consists of a beam target, video camera, analog image analyzer, calibration system, video digitizer and a minicomputer system. The calibration technique corrects for background illumination, target irregularities, vidicon shading and camera dark currents. A computer code corrects for off-axis camera angle and converts calibration and beam data into a map of screen irradiance. DOE

N79-32704# Brookhaven National Lab., Upton, N. Y.
EXPERIMENTAL PERFORMANCE STUDY OF A SERIES SOLAR HEAT PUMP
Edward A. Kush 1979 6 p refs Presented at the 4th Ann. Heat Pump Technol. Conf., Stillwater, Okla., 9-10 Apr. 1979
(Contract EY-76-C-02-0016)
(BNL-25928; Conf-790446-2) Avail: NTIS HC A02/MF A01

A systematic experimental study of heat pump performance at evaporator temperatures typical of series solar input, 50 to 100 F, was conducted using a laboratory assembled heat pump and specially constructed testing simulator. Results which show that coefficients of performance which follow the thermodynamic potential can be achieved are presented and discussed. DOE

N79-32705# Zia Associates, Inc., Boulder, Colo.
HEAT PUMP/ROCK BED STORAGE SYSTEMS
G. L. Mills and H. E. Remmers 1979 9 p refs Presented at the Solar Energy Storage Options Workshop, San Antonio, 18 Mar. 1979
(Contract EM-78-C-02-4704)
(COO-4704-2; Conf-790328-3) Avail: NTIS HC A02/MF A01

The characteristics of heat pump/rock bed storage components were analyzed and used to formulate TRNSYS models of potentially cost effective systems. The systems were then analyzed for performance on a typical house in Albuquerque, New Mexico and Madison, Wisconsin. Considerable emphasis was placed on system economics, since the principal goal of the project is to determine the most cost effective system. A new TRNSYS subroutine was developed to account properly for utility energy costs. DOE

N79-32706# Los Alamos Scientific Lab., N. Mex.
PASSIVE SOLAR HEATING FOR BUILDINGS
J. Douglas Balcomb 1979 16 p Presented at the Workshop on Passive Solar Design, Perth, Australia, 23 Feb. 1979
(Contract W-7405-eng-36)
(LA-UR-78-427; Conf-790224-1) Avail: NTIS HC A02/MF A01

A passive solar energy system is one in which the thermal energy flow is by natural means, that is by radiation, conduction, or natural convection. A survey of passive solar heating experience, especially in the U.S., is provided. Design approaches are reviewed and examples shown. Misconceptions are discussed. Advantages are listed. The Los Alamos program of performance simulation and evaluation is described and a simplified method of performance estimation is outlined. DOE

N79-32707# Institute of Gas Technology, Chicago, Ill.
PRODUCTION OF HIGH-ENERGY CHEMICALS USING SOLAR ENERGY HEAT Final Report, 1 Sep. 1977 - 31 May 1978
J. R. Dafler, J. Sinnott, M. Novil, B. D. Yudow, and M. G. Rackoff Dec. 1978 61 p refs
(Contract W-7405-eng-26; Proj. 8999)
(ORNL/SUB-7390/1) Avail: NTIS HC A04/MF A01

Techno-economic studies and thermodynamic assessments of chemical reactions and processes were made and the market potentials for major chemical commodities that use significant amounts of fossil resources were determined in order to identify energy-intensive processes that would be suitable for the production of chemicals and fuels using solar energy porcess heat. Of particular importance was the comparison of relative costs and energy requirements for the selected solar product versus costs for the product derived from conventional processing. The assessment methodology used a systems analytical approach to identify processes and products having the greatest potential for solar energy-thermal processing. Four conventional processes were selected for assessment namely, methanol synthesis, styrene monomer production, vinyl chloride monomer production, and terephthalic acid production. DOE

N79-32708# Pennsylvania Univ., Philadelphia. Dept. of Mechanical Engineering and Applied Mechanics.
ISOTHERMAL FLOW DISTRIBUTION IN SOLAR COLLECTORS AND COLLECTOR MANIFOLDS
Gerald F. Jones and Noam Lior 1978 5 p refs Presented at Meeting of the Am. Sect. of the Intern. Solar Energy Soc., Denver, 28-31 Aug. 1978
(Contract EM-78-C-04-5319)
(ALO-5319-1; Conf-780808-27) Avail: NTIS HC A02/MF A01

As a first step to a detailed analysis of the influence of flow in solar collector absorber tubes on the collector's heat transfer and thermal performance, the distribution of isothermal flow through a typical system consisting of two manifolds connected by a number of parallel riser-tubes was investigated. No thermal effects were taken into account. A discreet hydrodynamic model was developed for this system, and the resulting set of simultaneous nonlinear algebraic equations was solved numerically by the successive substitution method, for 23 different combinations of the major independent variables. Quantitative flow distribution results are presented. In the investigated range, it was determined that the two parameters which have the major influence on flow distribution are the ratio of riser diameter to manifold diameter, and the number of risers, with maldistribution increasing with both of them. DOE

N79-32709# Battelle Pacific Northwest Labs., Richland, Wash.
EFFECTS OF NONCONTACT CLEANERS ON TRANSPARENT SOLAR MATERIALS
H. L. Hampton and M. A. Lind Apr. 1979 72 p
(Contract EY-76-C-06-1830)
(PNL-2969) Avail: NTIS HC A04/MF A01

A brief study was undertaken to evaluate the performance of noncontact cleaning agents for use on solar collectors. Several techniques are used to compare cleansing agents which were recommended by their respective manufacturers for cleaning solar mirrors. Wetting and residue buildup properties were evaluated for over 50 of these commercially available cleaners. The wetting properties of each cleaner were evaluated by measuring the growth of the contact area of a constant volume drop as a function of time. Losses due to residue buildup were solar weighted and considered equally with the wetting parameters and cost figures to construct a figure of merit for cleaner comparison. DOE

N79-32710# Sandia Labs., Albuquerque, N. Mex.
STRUCTURAL OPTIMIZATION OF SHEET MOLDING COMPOUND LINE FOCUSING COLLECTORS
R. C. Reuter, Jr. and R. E. Allred 1979 6 p refs Presented at the 24th Ann. SAMPE Symp., San Francisco, 8 May 1979
(Contract EY-76-C-04-0789)
(SAND-79-0215C; Conf-790517-1) Avail: NTIS HC A02/MF A01

One of the primary structural components of a line focusing solar collector is the reflector support. In this design, it must be a stiff, light weight, parabolic trough which provides and maintains the correct optical shape for the reflective surface, and protects it from detrimental environmental effects. A viable candidate for the reflector support is a moldable, fiber reinforced, rib stiffened structure which has a low cost, high production rate potential. Material and analytical considerations made to insure that the sheet molding compound panel design meets specified structural requirements are described. A detailed analysis is provided and optimization is achieved through steps taken to minimize panel weight. DOE

N79-32711# Oak Ridge National Lab., Tenn.
WIND TURBINES
John C. Yeoman, Jr. Dec. 1978 61 p refs
(Contract W-31-109-eng-38)
(ANL/CES/TE-78-9) Avail: NTIS HC A04/MF A01

Wind turbines, ranging in size from 200 W to 10 MW, are discussed as candidates for prime movers in community energy systems. Estimates of performance characteristics and cost as a function of rated capacity and rated wind speed are presented. Data concerning material requirements, environmental effects, and operating procedures also are given and are represented empirically to aid computer simulation. DOE

N79-32712# Sandia Labs., Albuquerque, N. Mex.
SOLAR RADIATION MODEL VALIDATION
I. J. Hall, R. R. Prairie, H. E. Anderson, and E. C. Boes [1979] 5 p refs Presented at Intern. Solar Energy Soc. Meeting, Atlanta, 28 May 1979
(Contract EY-76-C-04-0789)
(SAND-79-1120C; Conf-790541) Avail: NTIS HC A02/MF A01

The accuracy of three solar radiation models was investigated. The data base used to assess the accuracy of these models was obtained from several sites in the new U.S. National Weather Service Network. Each of the models was used to estimate the solar radiation and the modeled radiation values were compared with observed radiation values. The most important results of these comparisons for the clear solar noon model and the total horizontal regression model are included here. DOE

N79-32713# Mechanical Technology, Inc., Latham, N. Y.
DEMONSTRATION OF A FREE PISTON STIRLING ENGINE DRIVEN LINEAR ALTERNATOR SYSTEM Annual Report
1 Sep. 1978 126 p
(Contract EY-76-C-02-2764)
(COO-2764-002) Avail: NTIS HC A07/MF A01

A linear alternator concept was demonstrated which meets design power requirements and will operate at 88 percent efficiency. A free piston Stirling engine/linear alternator energy conversion system was successfully tested, demonstrating concept feasibility. In particular, stable and controllable operation, gas bearing operation, and engine start-up using the alternator as a driver were demonstrated. A demonstrator preliminary design in which the system operating conditions and the system concept were defined was completed. In addition, the detailed demonstrator design layout was completed. One approach for analytically modeling free piston Stirling engines was evaluated. Based on this analysis, the decision was made to design the demonstrator with an existing free piston Stirling engine computer program. In addition, the development of a new computer program was initiated. DOE

N79-32714# Los Alamos Scientific Lab., N. Mex.
STATUS REVIEW OF THE TECHNOLOGY ASSESSMENT OF SOLAR ENERGY PROGRAM Interim Status Report
John H. Altseimer and Robert P. Blaunstein (DOE, Washington, D. C.) 1979 6 p refs Presented at the Intern. Solar Energy Soc. Meeting, Atlanta, 28 May 1979
(Contract W-7405-eng-36)
(LA-UR-79-1369; Conf-790541-4) Avail: NTIS HC A02/MF A01

A number of emerging solar technologies and selected applications were assessed for the environmental, institutional, and social impacts resulting from the large scale deployment of decentralized solar technologies. Two national energy scenarios for the year 2000 were used, one predicting 6 quads of solar and the other 14.2 quads. A few results of a preliminary study of the system characterization data are given. DOE

N79-32715# Planning Research Corp., McLean, Va.
APPLICATION AND SYSTEM DESIGN STUDY FOR COST-EFFECTIVE SOLAR PHOTOVOLTAIC SYSTEMS AT FEDERAL INSTALLATIONS
Mar. 1979 133 p refs
(Contract EG-77-C-01-2522)
(HCP/M2522-01) Avail: NTIS HC A07/MF A01

The results are given of an effort to identify the potential for cost effective solar photovoltaic power systems applications within the U.S. Federal Government. An implementation plan is provided for the installation of the first phase of cost effective applications. DOE

N79-32716# Los Alamos Scientific Lab., N. Mex.
SMALL-SCALE SOLAR SIMULATOR FOR INDOOR TESTING OF COLLECTOR MODULES AND MATERIALS
D. P. Grimmer and L. Bronisz 1979 8 p refs Presented at the 1979 Intern. Solar Energy Soc. Meeting, Atlanta, 28 May 1979
(Contract W-7405-eng-36)
(LA-UR-79-1335; Conf-790541-6) Avail: NTIS HC A02/MF A01

The simulator design follows general construction guidelines, but modifications were necessary to insure a + or - 10% uniform flux over a 0.1 sq m area. Considerable adjustments were necessary to achieve desired performance for the testing of collector modules and materials. These adjustments and details of simulator construction, including design schematics and simulator mounting, are described. Also presented are flux maps for the twelve lamp array. Finally, construction materials costs are discussed for this inexpensive solar simulator suitable for many-testing applications. DOE

N79-32717# Energy Resources Co., Inc., Cambridge, Mass.
POTENTIAL USE OF WOOD AND AGRICULTURE WASTES AS STEAM GENERATOR FUEL FOR THERMAL ENHANCED OIL RECOVERY Final Report
Herbert M. Kosstrin and Roy K. McDonald May 1979 32 p refs
(Contract EW-78-X-03-1038)
(SAN-1038-PO-1) Avail: NTIS HC A03/MF A01

The potential to use wood and agriculture wastes to replace crude oil as steam generator fuel was evaluated. California's San Joaquin Valley was the focus for the study. The production of waste materials by county, estimated energy value of each material, and estimated transportation cost for each material are documented. Both agriculture and wood wastes were found to be available in sizeable quantities and could become attractive steam generation fuels. However, some qualifications need to be made on the use of these materials. Transporation costs will probably limit the range of shipping these materials to perhaps 50 to 100 miles. Availability is subject to competition from existing and developing uses of these materials, such as energy sources in their immediate production area. Existing steam generators probably cannot be retrofitted to burn these materials. Fluidized bed combustion, or low Btu gasification, may be a good technology for utilization. DOE

N79-32718# Brookhaven National Lab., Upton, N. Y. Medical Dept.
AVOIDING FUTURE HEALTH PROBLEMS RELATED TO SOLAR ENERGY (PHOTOVOLTAIC) TECHNOLOGY
Louis V. Stang 4 Apr. 1979 25 p refs Presented at the Conf. on Health Implications of the New Energy Technol., Park City, Utah, 4 Apr. 1979
(Contract EY-76-C-02-0016)
(BNL-25935; Conf-790447-1) Avail: NTIS HC A02/MF A01

The hazards involved in disposing of solar cells at the end of their service life are discussed. Several chemical elements that are likely candidates for photovoltaic development are enumerated. The present state of knowledge concerning their toxicities are commented on briefly, and studies that should be undertaken in the near future to provide adequate information on these toxicities are suggested. DOE

N79-32719# Sandia Labs., Albuquerque, N. Mex.
AVAILABILITY OF WIND POWER
J. W. Reed 1978 15 p refs Presented at Seminar on Wind Energy for Electrical Generation, Recife, Brazil, 13-16 Feb. 1978
(Contract EY-76-C-04-0789)
(SAND-78-0548C; Conf-780253-1) Avail: NTIS HC A02/MF A01

Meteorological studies of available wind power to support the development of a vertical-axis wind turbine are presented and reviewed. Climatological studies that are needed to assist

and promote wind energy exploitation in Brazil are summarized. DOE

N79-32720# Sandia Labs., Livermore, Calif.
RECENT ADVANCES IN THERMOCHEMICAL ENERGY STORAGE AND TRANSPORT
T. T. Bramlette 1978 7 p refs Presented at 13th Intersoc. Energy Conversion Eng. Conf., San Diego, Calif., 20 Aug. 1978
(Contract EY-76-C-04-0789)
(SAND-78-8505; Conf-780801-22) Avail: NTIS HC A02/MF A01

The potential role of thermal storage systems based on reversible chemical reactions was investigated for both solar and nonsolar utilities. System studies are described for those based on the more promising chemical reactions which utilize calcium hydroxide, sulfur trioxide, and ammonium hydrogen sulfate. Chemical heat pipes and heat pump storage projects using sulfuric acid methanolates are also examined. DOE

N79-32721# Department of Energy, Oak Ridge, Tenn. Technical Information Center.
ENERGY INFORMATION DATA BASE. SERIAL TITLES
Jun. 1978 40 p
(TID-4579-R-10-Suppl-1) Avail: NTIS HC A03/MF A01

This supplement contains changes and additions to TID-4579-R10 and is intended to be used with that publication. DOE

N79-32722# Brookhaven National Lab., Upton, N. Y.
SYSTEMS FRAMEWORK FOR ENERGY ANALYSIS IN DEVELOPING COUNTRIES
Philip F. Palmedo Oct. 1978 18 p refs
(Contract EY-76-C-02-0016)
(BNL-25933) Avail: NTIS HC A02/MF A01

Criteria that successful energy planning must meet are outlined and some ways to go about such planning are suggested. Distinction is made between energy planning and energy policy analysis. Some concerns in national energy planning and policymaking considered are energy investment decisions, pricing policy, energy conservation policy, research and development policy, broad energy policies and strategies, and economic and social development planning. DOE

N79-32723# Department of Energy, Washington, D. C. Energy Information Administration.
ENERGY EMERGENCY MANAGEMENT INFORMATION SYSTEM (EEMIS): PROGRAM PLAN
Mar. 1979 123 p
(DOE/EIA-0135) Avail: NTIS HC A06/MF A01

The energy emergency management information system (EEMIS) program is described. EEMIS will be called upon to provide information to users as soon as fuel supply/demand imbalances are anticipated. Potential causes of fuel shortages where EEMIS would respond to are: sudden decreases in petroleum imports, gaseous fuel supplies, and petroleum production in the US; regional transportation outages; sudden decrease in coal production in the US; unanticipated heavy regional demand; and disruption of power plant operations. DOE

N79-32724# West Virginia Univ., Morgantown. Dept. of Geology and Geography.
IMPACTS OF THE RESOURCE CONSERVATION AND RECOVERY ACT ON THE SITING OF COAL-CONVERSION ENERGY FACILITIES IN THE UNITED STATES
Frank J. Calzonetti Feb. 1979 42 p refs
(Contract W-7405-Eng-26)
(ORNL/OEPA-12) Avail: NTIS HC A03/MF A01

Facilities holding wastes that are sited at sandy locations are likely to have serious leachate contamination problems forcing the developer to take special precautions or use expensive pond liners, such as membranes. The Resource Conservation and Recovery Act may add to the attractiveness of using low-ash coals because the amount of wastes generated depends critically on the amount of noncombustible material in the coal and will probably decrease the attractiveness of urban locations for new energy facilities. Most facilities producing the largest volumes of heavy, inexpensive substances are to be located far from the traditional markets and off barge-scale, navigable rivers. Long-distance overland hauls of ash and sulfur are infeasible, so ways must be found to use them locally. Markets for sulfur are more regionally concentrated than those for ash. DOE

N79-32725# Oak Ridge National Lab., Tenn.
PROPOSED INDUSTRIAL ENERGY DATA BASE FOR TECHNICAL EVALUATION OF ALTERNATIVE ENERGY SYSTEMS
Richard W. Barnes 1978 30 p Presented at the Workshop on Design of Ind. Energy Inform. Systems, Hilton Head Island, S. C., 6 Dec. 1978
(Contract W-7405-ENG-26)
(CONF-781244-1) Avail: NTIS HC A03/MF A01

Energy information required by industrial managers to make effective decisions concerning (1) management of energy use and supply, (2) introduction of new energy technology, and (3) conversion to new manufacturing processes is discussed. Energy accounting and auditing systems, significant technological and economic factors, and the pertinent external (to the industrial user) variables are also discussed. DOE

N79-32726# Oak Ridge National Lab., Tenn.
OVERVIEW OF WASTE HEAT UTILIZATION TECHNIQUES
Mitchell Olszewski Apr. 1979 18 p refs Presented at Am. Power Conf., Chicago, 23 Apr. 1979
(Contract W-7405-eng-26)
(CONF-790443-2) Avail: NTIS HC A02/MF A01

Cooling water from power plants is generally discharged in the range of 15 to 43 C (60 to 110 F) depending on the temperature of the available inlet water, quantity circulated, plant load, and heat-rejection system used. Possible uses for this low-grade heat include greenhouse horticulture; soil heating (both open field and in greenhouses); spray irrigation for frost protection; organic waste treatment (particularly for algae or biomass production); and aquaculture/mariculture. To date greenhouse and aquaculture/mariculture systems have received the most attention and have, therefore, progressed farthest. Several innovative techniques that utilize powerplant reject heat for these applications are described for the U.S., Canada, France, West Germany, and the USSR. DOE

N79-32727# California Univ., Livermore. Lawrence Livermore Lab.
ENERGY AND TECHNOLOGY REVIEW
Mar. 1979 29 p refs
(Contract W-7405-eng-48)
(UCRL-52000-79-3) Avail: NTIS HC A03/MF A01

A laser system that produces tunable, coherent beams of radiation covering the electromagnetic spectrum from below 200 nm in the ultraviolet to above 1000 nm in the infrared has been developed. The system uses a tunable dye laser in the visible region and converts the laser light to shorter and longer wavelength by stimulated Raman scattering in molecular hydrogen or deuterium gas. For example, in the ultraviolet region, wavelengths as short as 171.3 nm have been generated. Tunable ultraviolet beams can be applied to atomic and molecular spectroscopy as well as to isotopic and chemical analyses. DOE

N79-32728# Los Alamos Scientific Lab., N. Mex.
NEWLY DISCOVERED FAILURE MODE IN HIGH ENERGY DENSITY, ENERGY STORAGE CAPACITORS
G. P. Boicourt and E. L. Kemp Jul. 1978 7 p refs
(Contract W-7405-eng-36)
(LA-7378-MS) Avail: NTIS HC A02/MF A01

High energy density capacitors used for controlled themonuclear experiments are evaluated. Investigations are made to estimate the life of standard paper castor oil capacitors and to evaluate nonstandard units using different dielectric sandwiches and impregnants that might improve the life, cost, or size of the units. The statistical parameters of the failure distributions characterizing the life of standard and nonstandard units are reported. The failure modes of these units are analyzed to discover design changes that result in longer life. A.W.H.

N79-32729# European Space Agency, Noordwikj (Netherlands).
MICROSCOPIC INVESTIGATION OF ELECTROSTATIC DISCHARGE PHENOMENA ON NONCONDUCTIVE OPTICAL SOLAR REFLECTORS WITH A CONDUCTIVE ADHESIVE

S. J. Bosma Paris ESA Mar. 1979 25 p refs
(ESA-STM-211) Avail: NTIS HC A02/MF A01

Tests were performed on conventional nonconductive optical solar reflectors with a conductive adhesive in order to determine whether a conductive indium-oxide layer is absolutely necessary if electrostatic discharges are to be avoided. It was found that nonconductive PPE OSR's could be used in combination with a conductive if operated at room temperature or higher. A second result was the finding that nonconductive OCLI OSR's do not perform adequately with a conductive adhesive under the conditions concerned. The preferred overall solution remains to use conductive PPE or OSR's in combination with a conductive adhesive. Under no circumstances should an insulating backing be used to protect the metal reflector. Author (ESA)

N79-32730# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
DEVELOPMENT OF A PROTOTYPE 10kW SOLAR POWER PLANT Final Report
Dietmar Wolf, Herrmann Bihlmayr, Jochen Carl, Veit Merges, Peter Prikryl, and Peter Vinz Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 167 p refs In GERMAN; ENGLISH summary
(Contract BMFT-03E-4055-C/ETS-8000)
(BMFT-FB-T-78-33) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Ger. DM 34,90

A solar power plant built in the Federal Republic of Germany is described. The development of three other small plants for the generation of electricity from solar energy is also reported on. The design, installation, and commissioning of the plant and of the supporting systems are reviewed. Autonomous operation using technologies as simple as possible and components from series production is emphasized. During acceptance tests the specified maximum net electrical power output of 10 kW at a cooling water temperature of 35 C, the observance of the voltage and frequency tolerances for the generated current, and partial load operation were successfully demonstrated. Further long term tests under real operation conditions are recommended.
Author (ESA)

N79-32731# National Aerospace Lab., Amsterdam (Netherlands). Div. of Fluid Dynamics.
INVESTIGATIONS ON THE AEROELASTIC STABILITY OF LARGE WIND TURBINES
H. H. Ottens and R. J. Zwaan 10 Apr. 1978 21 p refs Presented at the 2d Intern. Symp. on Wind Energy Sys., Amsterdam, 3-5 Oct. 1978
(NPL-MP-78014-U) Avail: NTIS HC A02/MF A01

The aeroelastic stability of wind turbines with vertical axis (VAWT) and with horizontal axis (HAWT) is discussed. Results are given for an existing 5 m VAWT test-bed with and without a tie-down system. Finally, difficulties are discussed in interpreting preliminary results for a horizontal axis wind turbine. Stability, diagrams are shown. Author (ESA)

N79-32732# MITEC G.m.b.H., Ottobrunn (West Germany).
THE USE OF THE HEAT PUMPS TO RAISE TEMPERATURES IN AN ECONOMICAL AND ECOLOGICAL WAY Final Report, Jul. 1977
Max Huber and Fritz Bukau Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 295 p refs
(Contract BMFT-03E-5211-A/ETS-0004-A)
(BMFT-FB-T-78-35) Avail: NTIS HC A13/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Ger. DM 61,75

The use of heat pumps to transfer the cooling water from plant condensers to a hot water district heating system was investigated both from a thermodynamic and economic point of view. A model of the system was derived and evaluated in detail. The specific consumption of primary energy and the expected specific heat costs were determined, depending on different parameters. Results show that if certain marginal conditions are presumed, such district heating system may be equivalent to or even better than conventional hot water district heating performed on the basis of combined power-heat generation. Author (ESA)

N79-32733# Austrian Solar and Space Agency, Vienna.
METEOROLOGICAL DATA FOR SOLAR ENERGY APPLICATIONS
M. Bruck 1978 12 p refs
Avail: NTIS HC A02/MF A01

Meteorological quantities and the mathematical techniques used for acquiring them are presented. Their relevance to solar energy utilization is emphasized. Following a discussion of the definitions of extraterrestrial solar radiation and terrestrial radiation (thermal radiation), meteorological radiation quantities are listed and a formula, easily adaptable to a programmable pocket calculator, for the calculation of the yearly variation in the global radiation incident on a horizontal plane is presented. Air temperature, relative humidity, and wind are also discussed as important meteorological parameters. Author (ESA)

N79-32734# Polytechnic Inst. of New York, Brooklyn.
ASSESSMENT OF HYDROPOWER RESTORATION AND EXPANSION IN NEW YORK STATE, VOLUME 1
R. S. Brown and A. S. Goodman Aug. 1978 90 p Sponsored by the Power Authority of the State of New York and New York State Energy Research and Development Authority
(PB-295782/7; NYSERDA-78/6-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 10B

The study of the potential for the development of small scale hydropower indicates a potential of 3,000 megawatts of undeveloped capacity at a minimum of 754 sites in New York State. This figure for exceeds all previous estimates. The cost of such development will not be cheap but may well be competitive with new generating capacity either thermal or nuclear. Small hydropower has these added advantages: (1) this technology has the shortest time frame for implementation; (2) environmental impact will be minimal; and (3) socioeconomic impact will be positive. GRA

N79-32735# Office of Technology Assessment, Washington, D. C.
RENEWABLE OCEAN ENERGY SOURCES. PART 2: WORKING PAPERS: OCEAN WINDS, CURRENTS, WAVES, TIDES AND SALINITY GRADIENTS
Mar. 1979 153 p refs
(PB-295876/7) Avail: NTIS HC A08/MF A01 CSCL 10B

Renewable ocean energy systems are described. Six ocean energy systems are presented. They are: ocean thermal energy conversion, tidal power generation, ocean winds for windpowered generators, ocean waves for waterwave energy conversion, ocean currents, and salinity gradients. The relative potential for contributing to future energy supplies and the state of advancement are assessed. A.W.H.

N79-32736# New Mexico Energy Inst., Albuquerque.
THEORETICAL ANALYSIS OF A PASSIVE HEAT PIPE HEATING AND COOL SYSTEM
K. T. Feldman Dec. 1978 46 p refs Sponsored in part by N. Mex. Energy and Minerals Dept., Santa Fe
(PB-296066/4; NMEI-23/SA) Avail: NTIS HC A03/MF A01 CSCL 13A

A totally new concept which combines both a heat pipe and a flat plate solar collector for daytime solar water heating and nighttime water cooling was studied theoretically. Since the heat pipe is a passive heat transfer device, the entire system requires no pumps or auxiliary power for its operation. This makes the system reliable and should require very little maintenance. This system with a collector area of 400 sq ft can meet both winter space heating and summer space cooling requirements. For a typical winter day it can provide about 8000 lbs/day of hot water at 140 F or about 530,000 Btu/day. For a summer day it can provide about 4000 lbs/day of chilled water at 45 F or about 100,000 Btu/day for space cooling. GRA

N79-32737# Joint Center for Graduate Study, Richland, Wash.
INVESTIGATION OF LOW COST SOLAR CELLS BASED ON Cu2O Annual Progress Report, 1 Oct. 1975 - 30 Sep. 1976
Larry C. Olsen 30 Sep. 1976 91 p refs
(Grant NSF AER-75-20501)
(PB-295888/2; NSF/RANN/AER-75-20501/PR/76/3; NSF/RA-761743) Avail: NTIS HC A05/MF A01 CSCL 10B

Fabrication of thin-film backwall Cu/Cu2O cells, collection efficiency measurements and analysis, MIS solar cell theory, and initiation of frontwall solar cell studies are discussed. A system was established for controlled oxidation of copper. Both thick film and thin film backwall cells were fabricated and characterized. These cells typically have J about 0.00003 A/sq cm and n 3.5. Analysis of thick film diodes suggest that a high interface state density exists at the Cu-Cu2O junction. The thin film cells have very low shunt resistances due to the granular structure. Spectral collection efficiency of thin film backwall cells was measured to be 25 percent at 600 nm. Assuming a reasonable collection efficiency for backwall cells, the upper limit of performance for backwall cells is projected to be 4 percent. GRA

N79-32738# National Bureau of Standards, Washington, D. C. Center for Building Technology.
HUD UTILITIES DEMONSTRATION SERIES. VOLUME 9: DESCRIPTION OF THE DATA ACQUISITION AND INSTRUMENTATION SYSTEMS, JERSEY CITY TOTAL ENERGY PROJECT
Charles Bulik, William G. Rippey, C. Warren Hurley, and Daniel E. Rorrer Mar. 1979 161 p refs Sponsored in part by HUD
(PB-294926/1; NBSIR-79-1709) Avail: NTIS HC A08/MF A01 CSCL 13A

The design and operation of the instrumentation system and the data acquisition system used to monitor the total energy plant and certain utility services to the site buildings are described. A description of the types, characteristics, and locations of instruments used to measure physical variables is given. The capabilities and operational modes of the data acquisition system components are described in detail. A description of the total energy plant and site, instrument costs, data processing procedures and some of the instrumentation problems encountered is presented. GRA

N79-32739# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
ENERGY PROGRAMS AT THE JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LAB. Quarterly Report, Oct. - Dec. 1978
W. J. Toth, K. Yu, F. C. Paddison, R. S. P. Weissbrod, and C. S. Leffel, Jr. Jan. 1979 46 p refs Sponsored in part by DOE, Wash., D.C.
(PB-295439/4; APL/JHU/EQR-78/4) Avail: NTIS HC A03/MF A01 CSCL 10A

Progress in developing energy resources, utilization concepts, and storage methods is reported. Energy technology areas discussed include: (1) geothermal energy marketing and development in the Delmarva region of Maryland; (2) redevelopment of dams for small-scale hydroelectric energy projects; (3) ocean engineering and heat exchangers for ocean thermal energy conversion; and (4) flywheels and heat pumps for energy conservation and storage. K.L.

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N79-32740 Arizona State Univ., Tempe.
URBANIZATION AND ITS EFFECTS ON THE CLIMATE OF PHOENIX Ph.D. Thesis
Sheng-I Hsu 1979 216 p
Avail: Univ. Microfilms Order No. 7919183

All of the metropolitan Phoenix area within which growth is expected to occur by the year 2020 was studied. Because most of the National Weather Service's stations measure only temperature and precipitation, a comprehensive analysis of the spatial variation of climate through time was only made for these two parameters. The variation of other elements of climate, such as solar radiation, wind, visibility, and cloud cover, through time were analyzed for Phoenix Sky Harbor International Airport. Linear regression, Spearman Rank method, and power spectrum analyses were employed for the data interpretation. The mean data were compared for the periods 1900 to 1920 and 1961 to 1977. Precipitation declined by approximately two inches, while the minimum temperature increased by four F at Phoenix. Between the same periods, the mean minimum temperature differential between The phoenix city center and the suburban area increased from five to seven F. Dissert. Abstr.

N79-32741# National Oceanic and Atmospheric Administration, Washington, D. C.
REPORT TO THE CONGRESS ON OCEAN DUMPING RESEARCH. PUBLIC LAW 92-532, TITLE 2, SECTION 201 Annual Report, Jan. - Dec. 1976
Jul. 1977 25 p refs
(NOAA-S/T-77-2838; AR-4) Avail: NTIS HC A02/MF A01

The fourth annual report to the Congress by the Department of Commerce is presented. The National Oceanic and Atmospheric Administration (NOAA) research on ocean dumping during the calendar year 1976 is discussed. The research encompasses operations in the New York Bight and at Deepwater Dumpsite 106. Topics discussed under operations in the New York Bight include: (1) assessment of contaminant inputs; (2) sewage sludge dumping investigations; (3) dredged material dumping; (4) investigation of effects of ocean dumping; (5) Long Island Beach pollution; (6) anoxia event off the New Jersey coast; and (7) remote surveillance and monitoring. G.Y.

N79-32742# Comptroller General of the United States, Washington, D.C.
THE 16 AIR AND WATER POLLUTION ISSUES FACING THE NATION: APPENDIX TO REPORT
11 Oct. 1978 110 p ref
(CED-78-148C-App-1) Avail: NTIS HC A06/MF A01

The General Accounting Office (GAO) issued under separate cover an executive summary and a report entitled, 16 Air and Water Pollution Issues Facing the Nation. An appendix to that report is presented which includes case examples, technical papers, and other documents to support the views taken on some of the issues addressed in the report. The general topics addressed are: (1) support for views on air pollution issues; (2) support for positions on water pollution issues; (3) support for positions on multimedia pollution issues (pollution created by pollution control); and (4) support for positions on alternative strategies to controlling pollution (European trip report). G.Y.

N79-32743*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LABORATORY STUDY OF ANNOYANCE TO COMBINED AIRPLANE AND ROAD-TRAFFIC NOISE
Clemans A. Powell Washington Sep. 1979 40 p refs
(NASA-TP-1478; L-12977) Avail: NTIS HC A03/MF A01 CSCL 13B

The annoyance of noise, which consisted of both separate and combined airplane and road-traffic noises, was studied. The subjects judged each session as to how annoyed they were in the simulated living room laboratory environment and as to how annoyed they were if they heard the noise in their home during day, evening, and night periods. The airplane noises, for equal session levels were judged significantly more annoying than the road traffic noises for the separate sessions. For the combined sessions, an interaction was found between the airplane noise and traffic noise levels, which was not adequately assessed by the total energy concept. Significant differences were found between the projected home responses for the day, evening, and night periods. A.W.H.

N79-32744*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A SUMMATION AND INHIBITION MODEL OF ANNOYANCE RESPONSE TO MULTIPLE COMMUNITY NOISE SOURCES
Clemans A. Powell Washington Sep. 1979 23 p refs
(NASA-TP-1479; L-12978) Avail: NTIS HC A02/MF A01 CSCL 13B

A model of annoyance due to combined noise sources was developed. The model provides for the summation of the subjective magnitudes of annoyance due to the separate noise sources and for the inhibition of the subjective magnitudes of each source by the presence of the other noise sources. The inhibition process is assumed to mathematically obey a power-group transformation. The results of an experiment in which subjects judged the annoyance of 15 minute sessions of combined aircraft and with

several other models of combined source annoyance. These comparisons indicated that the model developed herein provides better qualitative and quantitative agreement with experimental responses than the other models. The application of the model to multiple community noises is discussed. G.Y.

N79-32745# Argonne National Lab., Ill.
SURVEY OF BIOMEDICAL AND ENVIRONMENTAL DATA BASES, MODELS, AND INTEGRATED COMPUTER SYSTEMS AT ARGONNE NATIONAL LABORATORY
I. P. Murarka, D. J. Bodeau, J. M. Scott, and R. H. Huebner Aug. 1978 355 p
(Contract W-31-109-eng-38)
(ANL/ES-65) Avail: NTIS HC A16/MF A01

An inventory (index) of information resources pertaining to biomedical and environmental projects at Argonne National Laboratory is presented. The information resources include a data base, model, or integrated computer system. Entries are categorized as models, numeric data bases, bibliographic data bases, or integrated hardware/software systems. Descriptions of the Information Coordination Focal Point (ICFP) program the system for compiling this inventory, and the plans for continuing and expanding it are given, and suggestions for utilizing the services of the ICFP are outlined. DOE

N79-32746# Department of Energy, Washington, D. C.
ENVIRONMENTAL DEVELOPMENT PLAN, FOSSIL FUEL UTILIZATION PROGRAM
Apr. 1979 101 p refs
(DOE/EDP-0046) Avail: NTIS HC A06/MF A01

A common basis for planning, managing, and reviewing all environmental aspects of the energy programs under DOE's jurisdiction is provided by environmental development plans (EDP) which identify the environmental concerns and research and development necessary for assessing the potential environmental impacts and mitigating measures associated with an energy technology. To ensure that environmental, health, and safety (EH&S) considerations will be addressed adequately in the technology decision making process, the EDP (1) identifies and evaluates EH&S concerns; (2) defines EH&S research and related assessments to examine or resolve the concerns; (3) provides a coordinated schedule with the technology program for required EH&S research and development; and (4) indicates the timing for environmental assessments, environmental impact statements, environmental readiness documents, and safety analysis reports. DOE

N79-32747# Water Purification Associates, Cambridge, Mass.
WATER RELATED ENVIRONMENTAL EFFECTS IN FUEL CONVERSION. 1: SUMMARY VOLUME
H. Gold and D. J. Goldstein 1978 259 p refs
(Contract EX-76-C-01-2445)
(FE-2445-1-Vol-1) Avail: NTIS HC A12/MF A01

Effects that could be expected from siting specific conversion plants at given locations in the major coal and oil shale bearing regions of the United States were investigated. The synthetic fuel technologies examined include: coal gasification to convert coal to pipeline gas; coal liquefaction to convert coal to low sulfur fuel oil; coal refining to produce a de-ashed, low sulfur solvent refined (clean) coal; and oil shale retorting to produce synthetic crude. The results presented include the range of water requirements, the conditions for narrowing the range and optimizing the use of water, the ranges of residual solid wastes, and the cost and energy requirements for wastewater treatment. Water resources data in the coal and oil shale regions were assessed. Potential water supply sources for each site were evaluated in terms of the available water supply. The degree of wet cooling used to dissipate waste heat was determined on the basis of water availability and cost. DOE

N79-32748# Argonne National Lab., Ill.
RECENT MEASUREMENTS OF THE RATES OF OZONE REMOVAL FROM THE ATMOSPHERE BY LAND SURFACES
M. L. Wesely, J. A. Eastman, D. R. Cook, and B. B. Hicks 1978 14 p refs Presented at the 71st Ann. Meeting of the Air Pollution Control Assoc., Houston, Tex., 25-29 Jun. 1978
(Contract W-31-109-eng-38)
(CONF-780636-11; Paper-78-30.5) Avail: NTIS HC A02/MF A01

Measurements of ozone flux obtained directly by eddy correlation techniques above certain agricultural surfaces are examined. The surface properties that are important in regulating the rate of ozone destruction at the surface are determined including estimated stomatal resistance. DOE

N79-32749# Stanford Univ., Calif. Dept. of Statistics.
SOME PROBLEMS OF VALIDATION AND TESTING OF NUMERICAL AIR POLLUTION MODELS
Paul Switzer and P. Zannetti Sep. 1978 18 p refs
(Contract EY-76-S-02-2874)
(COO-2874-41; SU-TR-21) Avail: NTIS HC A02/MF A01

Uses of deterministic and stochastic models in air pollution modeling are reviewed briefly. An analysis of the problem of validation and testing of a general air pollution numerical model is developed, and the different diagnostic checks applied in the literature are discussed in order to identify a good validation procedure in this field. A simple numerical model for the short-term real-time forecasting of CO hourly values in the St. Louis, Missouri area was developed. Author (DOE)

N79-32750# Argonne National Lab., Ill. Atmospheric Physics Section.
GUIDE FOR ESTIMATING DRY DEPOSITION VELOCITIES OF SULFUR OVER THE EASTERN UNITED STATES AND SURROUNDING REGIONS
C. M. Sheih, M. L. Wesely, and B. B. Hicks Apr. 1979 62 p refs
(Contract W-31-109-ENG-38)
(ANL/RER-79-2) Avail: NTIS HC A04/MF A01

Atmospheric dry deposition velocities of sulfur dioxide and sulfate particles in the eastern United States and surrounding areas are estimated as functions of location, season, and atmospheric stability. The necessary data sets include a tabulation of the land-use types and a listing of the surface roughnesses and deposition resistances assigned to each land-use type for the conditions likely to be found during spring, summer, and winter. The estimates of deposition velocity are tabulated and presented as maps, which are particularly useful when only rough estimates of the deposition velocities are required or when meteorological data for estimating atmospheric stability are very limited. The land-use map and surface roughnesses can also be applied to other purposes, such as to describe the surface characteristics for a regional-scale dynamic model. The results obtained are stored in the data bank maintained at Brookhaven National Laboratory under the U.S. DOE MAP3S program. DOE

N79-32751# Saarbergwerke A.G. Saarbrueken (West Germany). Hauptabt. Forschung und Entwicklung, Umweltschutz.
ENGINEERING STUDY OF THE FLUE GAS DESULFURIZATION UNIT FOR THE POWER PLANT WEIHER 3 Final Report, Jun. 1977
Friedrich Hofmann, Heinrich Igelbuescher, and Gerhard Scholl Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 55 p refs In GERMAN; ENGLISH summary
(Contract BMFT-03E-1012/ETS-6000-A)
(BMFT-FB-T-78-28) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Ger. DM 11,35

Following the experience gathered during operation of the test facility for flue gas desulfurization at the Weiher 2 power station, the possible construction of a fullscale plant was examined. Results show that with a few exceptions the successful concept of Weiher 2 can be retained as well as the equipment and aggregates used there. The technology transfer of the experience gathered at the test facility for a flue gas throughput of 125,000 cu m/hr to the projected plant is shown to be feasible. In individual cases improvements are possible regarding the equipment and aggregates. For example the installation of the fan (now preceding the plant) or the general use of shallow bottoms for the tanks instead of hopper gates is discussed. Author (ESA)

N79-32752# Oxford Univ. (England). Dept. of Engineering Science.
RIVER QUALITY MODELS NEAR OUTFALLS

C. J. Harris 1978 48 p refs
(OUEL-1270/78) Avail: NTIS HC A03/MF A01

Mathematical models of urban water runoff, the activated sludge process, and of river quality are derived and simulated. The analytic and practical problems encountered in the development of dynamic models of composite water quality are briefly reviewed. These techniques used in the modeling and control of river water quality near effluent outfalls, are illustrated using hypothetical urban examples. An advection-diffusion equation is used to describe conversion of matter in this pollution phenomenon. Urban and overland pollutant flow models are derived. The contribution of wastewater treatment plants to overall river pollution is demonstrated. The use of these mathematical models to control river water quality is suggested. Author (ESA)

N79-32753# National Oceanic and Atmospheric Administration, Washington, D. C.
COST-BENEFIT ANALYSIS OF SELECTED ENVIRONMENTAL AND DATA INFORMATION SERVICE PROGRAMS
Robert C. Anderson and Norman F. Meade Jan. 1979 61 p refs
(PB-297189/3; NOAA-TM-EDIS-25; NOAA-79052101) Avail: NTIS HC A04/MF A01 CSCL 05B

The cost benefit of five programs of the Environmental Data and Information Service (EDIS) was evaluated. The basic supporting theory for cost benefit analysis of information programs is outlined and the development of the methodology for evaluation of EDIS programs is explained. The methods of benefit assessment and the method of cost assessment that was used are explained. The results from each of the five case studies are presented along with conclusions and recommendations for further research. GRA

N79-32754# Pacific Environmental Services, Inc., Santa Monica, Calif.
VOC (VOLATILE ORGANIC COMPOUNDS) EMISSIONS REDUCTION STUDY FOR OXIDANT ATTAINMENT IN MASSACHUSETTS, RHODE ISLAND, AND CONNECTICUT Final Report
Peter J. Drivas, Robert J. Gordon, and Katherine Wilson Mar. 1979 60 p refs
(Contract EPA-68-02-2606)
(PB-294983/2; EPA-901/9-79-007) Avail: NTIS HC A04/MF A01 CSCL 13B

A review was conducted available models which relate ozone concentrations to VOC and NOx emissions. The city-specific version of the Empirical Kinetic Modeling Approach (EKMA) was recommended as the most appropriate model for New England with reasonable input and computer requirements. This model was applied to Bridgeport New Haven, CT; Providence, RI; Boston, MA; Springfield, MA; and Worcester, MA to compute VOC emission reductions necessary to achieve current and future Federal Oxidant Standards. The ozone design values and transported ozone values were selected to reflect the maximum requirement for VOC emission reduction. All no. 3 monitoring data for Massachusetts, Connecticut and Rhode Island were adjusted to a common basis by taking into account EPA calibration audits and changes in calibration procedures. GRA

N79-32755# Pacific Environmental Services, Inc., Santa Monica, Calif.
SUMMARY OF GROUP 1 CONTROL TECHNIQUE GUIDELINE DOCUMENTS FOR CONTROL OF VOLATILE ORGANIC EMISSIONS FROM EXISTING STATIONARY SOURCES
P. R. Peterson and R. R. Sakaida Dec. 1978 42 p refs
(Contract EPA-68-02-2606)
(PB-294975/8; EPA-450/3-78-120) Avail: NTIS HC A03/MF A01 CSCL 13B

Control Technique Guideline (CTG) documents were prepared by the Office of Air Quality Planning and Standards of the U.S. EPA to assist the states in defining reasonably available control technology (RACT) for the control of volatile organic compound emissions from existing stationary sources. Those CTGs issued as of January 1978 including a design criteria document for gasoline service stations. A description of each source category is provided, along with RACT and costs to retrofit a model facility. Source categories included are: surface coating of cans, metal coils, fabric, paper products, automobile and light duty trucks, metal furniture, magnet wire, and large appliances; gasoline terminals, bulk plants and service stations; fixed roof petroleum storage tanks; miscellaneous refinery sources: outback asphalt; and solvent metal cleaning (degreasing). GRA

N79-32756# Research Corp. of New England, Wethersfield, Conn.
ASSESSMENT OF SURFACE RUNOFF FROM IRON AND STEEL MILLS Final Report, Apr. 1976 - Jun. 1978
G. T. Brookman, B. C. Middlesworth, and J. A. Ripp Research Triangle Park EPA Feb. 1979 176 p refs
(Contract EPA-68-02-2133)
(PB-294981/6; EPA-600/2-79-046) Avail: NTIS HC A09/MF A01 CSCL 13B

Surface runoff from iron and steel mills is studied and a determination is made as to whether it is an environmental problem. A compilation of available data, information gathered from plant tours, and results of a field survey at two fully integrated mills on tidal rivers are presented. Data collected at the two sites indicate that coal/coke storage piles and handling areas have the highest potential for contaminating stormwater. The data also indicate that total suspended solids runoff concentrations are typical of urban runoff concentrations, while total dissolved solids values are about one to two times the typical urban runoff concentrations. Current stormwater controls in the steel industry are limited. Except for runoff from coal/coke storage areas, stormwater runoff is not a problem when compared to point source control. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N79-32757 California Inst. of Tech., Pasadena.
SEISMOLOGICAL STUDIES USING OBSERVED AND SYNTHETIC WAVEFORMS Ph.D. Thesis
Rhett Giffen Butler 1979 289 p
Avail: Univ. Microfilms Order No. 7920341

The application of waveforms to four topics in seismology is presented. Waveform analyses of three earthquakes are reported. Shear travel times are obtained by a waveform correlation technique. The shear phase (SS) is modeled using a Hilbert transformation to mimic distortion incurred at an internal caustic in its propagation. Significant variation is found in SS travel time residuals for paths reflected under the Canadian shield. Direct body waves and fundamental surface waves are calculated for a credible, hypothetical great earthquake on the San Andreas fault. Amplitudes and durations of long period ground motion ($T > 1$ second) are found for a receiver in downtown Los Angeles. Short period P wave amplitudes from nuclear explosions in the Soviet Union recorded by WWSSN stations in the United States are presented. A well defined amplitude pattern is obtained for each source region. Dissert. Abstr.

N79-32758 Cornell Univ., Ithaca, N. Y.
DEEP CRUSTAL ELECTRICAL CONDUCTIVITY IN THE ADIRONDACKS Ph.D. Thesis
John E. P. Connerney 1979 232 p
Avail: Univ. Microfilms Order No. 7920255

Controlled and natural source electromagnetic induction experiments in the Adirondack Precambrian shield region of northern New York State indicate that the electrical conductivity of the crust is consistent with laboratory studies of moist igneous rock and in discord with measurements on dry rock. A highly conductive layer found in the lower crust suggests a compositional change at these depths. Magnetic field data indicate a conductivity of .0001 MHOS/M extending to 10 km, underlain by a conductivity of .001 MHOS/M to 22 km. At 22 kilometers, the conductivity increases to between approximately .04 and approximately .08 MHOS/M. Geomagnetic fluctuations in the period range 10 to 200 seconds indicate that the conductive feature in the lower crust is of finite extent, with a conductance of approximately 400 MHOS. Longer period fluctuations in the

range 200 to 2000 seconds indicate a large degree of uniformity in the area. Dissert. Abstr.

N79-32759 California Inst. of Tech., Pasadena.
STEADY CAPILLARY-GRAVITY WAVES ON DEEP WATER Ph.D. Thesis
Benito Miguel ChenCharpentier 1979 150 p
Avail: Univ. Microfilms Order No. 7919858

Two different formulations to the problem are given. The theory of simple bifurcation is reviewed. For small amplitude waves a formal perturbation series is used. The Wilton ripple phenomenon is re-examined and shown to be associated with a bifurcation in which a wave of permanent form can double its period. Wilton's ripples are a special case of a more general phenomenon in which bifurcation into subharmonics and factorial higher harmonics can occur. Numerical procedures for the calculation of waves of finite amplitude are developed. Bifurcation and limit lines are calculated. Pure and combination waves are continued to maximum amplitude. The height is limited in all cases by the surface enclosing one of more bubbles. Results for the shape of gravity waves are obtained by solving an integro-differential equation. Dissert. Abstr.

N79-32760 New York Univ., N. Y.
AN ANTI-MACH METRIC IN THE JORDAN-BRANS-DICKE THEORY OF GRAVITATION Ph.D. Thesis
Leon Paul Johnson 1979 34 p
Avail: Univ. Microfilms Order No. 7918970

The Jordan-Brans-Dicke gravitation theory, a more general theory of gravitation than the Einstein theory, states there is a space-time dependent scalar field in addition to the tensor gravitational field. The scalar field is related to the gravitational constant. The Jordan formulation is based on the Dirac large number hypothesis, while the Brans-Dicke formulation is based on Mach's Principle. The field equations of both forms are essentially the same. Whether one or both of these assumptions is correct is examined. A set of time dependent plane wave solutions is found for this gravitation theory. The global properties of these solutions are examined, in particular geodesic completeness, to determine if the various forms of Mach's Principle are satisfied. These solutions violate Mach's Principle as expressed by Brans and Dicke. Dissert. Abstr.

N79-32761 California Inst. of Tech., Pasadena.
THEORETICAL INVESTIGATIONS OF EXPERIMENTAL GRAVITATION Ph.D. Thesis
Carlton Morris Caves 1979 258 p
Avail: Univ. Microfilms Order No. 7920342

The investigation of experiments which are used to test relativistic gravity, and the investigation of technologies and experimental techniques which are applied to gravitational wave astronomy are discussed. Pure laboratory experiments with laboratory sources of non-Newtonian gravity and laboratory detectors are reported. The key advance in technology is the development of resonant sensing systems with very low levels of dissipation. Three such systems, torque balances, dielectric monocrystals, and superconducting microwave resonators are considered. Eight laboratory experiments which use these systems as detectors are proposed. The dominant sources of noise and the technology required for each experiment are described.
Dissert. Abstr.

N79-32762 Rice Univ., Houston, Tex.
ROCKET-BASED MEASUREMENT OF BIRKELAND CURRENTS IN AN ACTIVE POST-MIDNIGHT AURORA Ph.D. Thesis
William Robin Coley 1979 172 p
Avail: Univ. Microfilms Order No. 7919573

At 10:45 U.T. on March 1, 1976, an instrumented payload was launced by a Nike-Tomahawk rocket from Poker Flat, Alaska. The payload passed over auroral breakup activity which had a visual intensity of about 150 kR. An electron detector covering the 8-10 keV energy range observed electron precipitation while a cesium vapor vector magnetometer measured magnetic perturbations along the vehicle trajectory. From the magnetic measurements a current system consisting of horizontal electrojets and two pairs of oppositely directed field-aligned current sheets was inferred. Results indicate that the ionosphere acts as an electrical load, providing the closing current for Birkeland current flow being generated out in the magnetosphere. Dissert. Abstr.

N79-32763 Institut d'Aeronomie Spatiale de Belgique, Brussels.
LONG TERM EFFECT ON THE OZONE LAYER OF NITROGEN OXIDES PRODUCED BY THERMONUCLEAR EXPLOSIONS IN THE ATMOSPHERE
G. Brasseur 1979 21 p refs Submitted for publication
(Aeronomica-Acta-A-198-1979) Avail: Issuing Activity

In order to determine whether NO molecules formed as a result of thermonuclear explosions in the atmosphere have a significant effect on the composition of the ozonosphere, ozone concentration data was studied. Nuclear tests carried out by the U.S.S.R. and the United States between 1961 and 1962 were investigated. The data provided by the Arosa station since 1932 and by the ozone world network since 1957 were considered. No long term ozone depletion can be found. However, if the bulges observed in the ozone records at low and high latitudes the day after nuclear blasts are statistically significant, they could be attributed to a chemical chain reaction producing ozone in the presence of HO2 and NO. Author (ESA)

N79-32764 Institut d'Aeronomie Spatiale de Belgique, Brussels.
COMPARISONS BETWEEN VARIOUS SEMI-EMPIRICAL THERMOSPHERIC MODELS OF THE TERRESTRIAL ATMOSPHERE
F. Barlier (Centre d'Etudes et de Rech. Geodyn. et Astron.), C. Berger (Centre d'Etudes et de Rech. Geodyn. et Astron.), J. L. Falin (Centre d'Etudes et de Rech. Geodyn. et Astron.), G. Kockarts, and G. Thuiller (CNRS, Verrieres-le-Buisson, France) 1979 39 p refs Submitted for publication
(Aeronomica-Acta-A-199-1979) Avail: Issuing Activity

The availability of various global thermospheric models allows intercomparisons to be made for identical geophysical conditions. The solar activity effect, geomagnetic effect, diurnal variations, annual variation, and latitudinal-seasonal dependence are analyzed in four semi-empirical models, viz. DTM, MSIS, ESRO 4 and J77. Emphasis is given to the discrepancies between the models, and some direct comparisons are made with satellite drag data and micro-accelerometer results. It is shown that none of the semi-empirical models can represent correctly all geophysical aspects of the terrestrial thermosphere. Author (ESA)

N79-32765 Institut d'Aeronomie Spatiale de Belgique, Brussels.
AERONOMICAL MODELS OF THE STRATOSPHERE [MODELES AERONOMIQUES DE LA STRATOSPHERE]
G. Brasseur 1979 85 p refs In FRENCH; ENGLISH summary Submitted for publication
(Aeronomica-Acta-A-202-1979) Avail: Issuing Activity

After a brief presentation of the fundamental equations describing the physical and chemical behavior of the atmosphere, it is shown how these equations can be simplified in order to model the distribution, the transport, and the balance of the most important stratospheric constituents. The principal mathematical methods used to solve such problems are presented. Moreover, a particular two-dimensional model is described as an example. Finally, the methodology used to model anthropogenic perturbations related to the injection of nitrogen oxides by stratospheric vehicles and to the emission of chlorofluoramethanes is briefly described. Author (ESA)

N79-32766 Institut d'Aeronomie Spatiale de Belgique, Brussels.
ULTRAVIOLET ABSORPTION SPECTRUM OF METHYLCHLOROFORM IN THE VAPOR PHASE
N. VanLaethem-Meuree, J. Wisemberg, and P. C. Simon 1979 20 p refs Submitted for publication
(Aeronomica-Acta-A-203-1979) Avail: Issuing Activity

Ultraviolet absorption cross sections of methylchloroform CH3CCl3 were measured in the wavelength interval 180-240 nm and temperature range 210 to 295 K. Numerical values are given and compared with existing data at ambient temperature. Photodissociation coefficients were calculated for altitudes between 20 and 45 km and appear to be significantly lower than generally considered. Results show that the substantial decrease in absorption cross sections observed at low temperatures and lambda > 210 nm has only a minor influence on overall photodissociation coefficients. Relative contributions of photodissociation and reaction with OH radicals as potential sinks

for methylchloroform at stratospheric altitudes are also briefly discussed. Author (ESA)

N79-32767 Institut d'Aeronomie Spatiale de Belgique, Brussels.
TEMPERATURE, MOLECULAR NITROGEN CONCENTRATION AND TURBULENCE IN THE LOWER THERMOSPHERE INFERRED FROM INCOHERENT SCATTER DATA
D. Alcayde (Centre d'Etude Spatiale des Rayonnements), G. Fontanari (Centre d'Etude Spatiale des Rayonnements), G. Kockarts, P. Bauer (Centre de Rech. en Phys. de l'Environ. Terrest. et Planetaire, Issy-les-Morulineaux, France), and R. Bernard (Centre de Rech. er Phys. de l'Environ. Terrest. et Planetaire, Issy-les-Moulineaux, France) 1979 43 p refs Submitted for publication
(Aeronomica-Acta-A-204-1979) Avail: Issuing Activity

Incoherent scatter data gathered over almost one solar cycle (1967 to 1975) in the height range 95 to 150 km at 45 deg North latitude, provide an opportunity to study and to model long term variations in the daytime neutral temperatures and the N2 concentration. The main features identified are the absence of solar cycle effects in the temperature variations around 100 km, a minimum in the daily mean temperature profile around 100 km moving upwards from summer to winter with consequently a reversal in the seasonal trend above and below 100 km, an increase in the daily mean N2 density around 100 km for solar maximum conditions, and a gradual change from a pure semi-annual variation at 95 km to a dominant seasonal variation above 100 km in the daily averaged N2 concentration. The temperature data are used to compute the vertical eddy diffusion coefficient between 95 and 120 km for equinox and solstice conditions. Large seasonal variations are apparent in the daily averaged eddy diffusion coefficients. Author (ESA)

N79-32768# Ohio State Univ., Columbus. Dept. of Geodetic Science.
STUDIES IN GRAVIMETRIC GEODESY Final Report, 1 Jan. 1977 - 30 Sept. 1978
Yrho A. Yotila Hanscom AFB, Mass AFGL Dec. 1978 71 p refs
(Contract F19628-77-C-0082)
(AD-A064741; AFGL-TR-78-0302) Avail: NTIS HC A04/MF A01 CSCL 08/7

Brief mention is made of the scientific reports submitted under the contract: Recent Development in the Geodetic Boundary Value Problem and Non-Stationary Estimation in Gravity Prediction Problems. The rest of the report concentrates on two technical subjects: (1) selection of preferred locations of new absolute gravity measurements in gravity base-station networks; and (2) analyses on the location of absolute gravity measurements for calibration of gravimeters. Author

N79-32769# Ohio State Univ., Columbus. Dept. of Gaodetic Sciences.
A GLOBAL 1 DEG. x 1 DEG. ANOMALY FIELD COMBINING SATELLITE, GEOS-3 ALTIMETER AND TERRESTRIAL ANOMALY DATA
Tichard H. Rapp Hanscom AFB, Mass. AFGL Sep. 1978 20 p refs
(Contract F19628-76-C-0010)
(AD-A064740; AFGL-TR-78-0282; Rept-278; SR-22) Avail: NTIS HC A02/MF A01 CSCL 04/1

A method for combining satellite derived potential coefficient, mean 1 deg x 1 deg anomalies derived from the Geos-3 altimeter data, and mean 1 deg x 1 deg anomalies estimated from terrestrial gravity data is described. The combination procedure is designed to obtain an adjusted set of potential coefficients and an adjusted set of 64800 1 deg x 1 deg mean anomalies. The adjusted anomalies can be developed into potential coefficients to as large a degree as is reasonable considering the 1 deg x 1 deg data. Such anomalies will be exactly consistent with the adjusted potential coefficients. G.Y.

N79-32770# Texas Univ. at Dallas, Richardson.
AURORAL DATA ANALYSIS Final Report, 1 Aug. 1975 - 31 Jan. 1979
J. David Winningham and Fordon G. Shepherd 26 Mar. 1979 152 p refs
(Contract F19628-76-C-0005; AF Proj. 7663)
(AD-A070180; AFGL-TR-79-0071) Avail: NTIS HC A08/MF A01 CSCL 04/1

Based on the ISIS-1 and 2 data set it has been possible to meet the goals set forth in this contract. The particle-optical empirical relationships derived can be used to relate 6300 A emissions to low-energy 300 EV fluxes in a quantitative way and vice-versa. If suitable ionization production models were available, then 300 EV energy fluxes 'images' derived from concurrent 6300 A images, could be utilized to predict F-region behavior. One possible result would be the derivation of an estimate of FOF2 during darkened conditions. This result along with the local time position of the trough would allow an estimate of the severity of scattering from the steep poleward wall of the trough and the fluctuations embedded in it. Knowledge of the IMFB sub z component in near real time would allow a dynamic 'prediction' of the trough wall. Such a prediction could be used to allow reconfiguration of systems affected by the trough wall and fluctuations at or near it. Author (GRA)

N79-32771# North Carolina State Univ. at Raleigh. Dept. of Electrical Engineering.
D REGION AMPLITUDE DISTRIBUTION, CONE ANGLE OF ARRIVAL, AND ELECTRON DENSITY PROFILES Final Report, 1974-1978
W. A. Flood, H. N. Turner, and T. F. Shirley Jun. 1979 47 p refs
(Grants DAHC04-74-G-0161; DAAG29-76-G-0138)
(AD-A070358; ARO-11054.1-GS) Avail: NTIS HC A03/MF A01 CSCL 04/1

The results of analytical and experimental investigations of D region backscattering processes and their effects on the accuracy of electron density profiles produced by the partial reflection technique are presented. The major findings were that the cone angle of arrival of D region echoes is approximately 13 degrees but on occasion can be significantly greater for both O and X polarizations; in the altitude regime between 74 and 80 kilometers, X-wave cone angles can be greater than O wave cone angles of arrival and this phenomenon is associated with local minima in the electron density profiles; the cone angle of arrival can be large enough that altitude resolution of the experiment is determined by the D region backscatter and not by the pulse length of the transmitter. D region echoes were shown to be Rayleigh distributed lending support to the concept of volume scattering from fluctuations of refractive index. Finally the seasonal variation of D region electron density profiles was established. GRA

N79-32772# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ATMOSPHERIC EXTINCTION. 1: SYNTHETIC DATA
J. M. Sorvari 12 Apr. 1979 34 p refs
(Contract F19628-78-C-0002; AF Proj. 2128)
(AD-A071006; EST-43-1; ESD-TR-79-75) Avail: NTIS HC A03/MF A01 CSCL 20/6

Synthetic data, simulating the effects of atmospheric extinction on GEODSS observations, are presented. Approximate representations for the atmospheric extinction coefficients and for spectral photon distributions are also developed. Together these data are intended for evaluation of the effects of the atmosphere on space object identification data, and for the development and testing of models for correcting atmospheric extinction. GRA

N79-32773# Electronics Research Lab., Adelaide (Australia).
AN IMPROVED IONOSPHERIC IRREGULARITY MODEL
D. G. Singleton Nov. 1978 42 p refs
(AD-A070282; ERL-0046-TR) Avail: NTIS HC A03/MF A01 CSCL 20/14

Modifications are made to the global model developed by Fremouw, et al. for the incremental electron density of F-layer irregularities in order to force the model into agreement with a considerable body of scintillation and spread F data. While special attention is given to the equatorial region, where the original model was particularly lacking, the results of other studies are used to update the model in the other latitude regions and so provide a model of general application. The model now embodies the effect of magnetic activity at all latitudes, variations of occurrence with longitude in the equatorial region, variability of the width and position of the equatorial region, the influence of irregularity layer thickness, irregularity shape and electron

density power spectrum, as well as the diurnal, seasonal and sunspot cycle variations of irregularity occurrence and strength at all latitudes. The improvements proposed not only enhance the model's usefulness as a simulation technique in engineering applications, but should also provide an impetus to the understanding of the physics of the irregularities. GRA

N79-32774# Kansas State Univ., Manhattan. Dept. of Physics.

INFINITE CLOUD MODEL OF ELECTRIFICATION BY THE PRECIPITATION MECHANISM IN THE PRESENCE OF HIGH RATES OF ION GENERATION

J. D. Spangler and C. E. Rosenkilde 19 Jun. 1978 33 p refs
(Contract W-7405-eng-48)
(UCRL-13860) Avail: NTIS HC A03/MF A01

A simple, infinite-cloud, precipitation-mechanism model of thundercloud electrification was extended to include effects due to the presence of radioactive aerosol particles. These effects involve ion generation, currents due to motions of ions and charged aerosol particles, and collection of ions and aerosol particles by hydrometeors and cloud droplets. It is concluded that an ion pair generation rate G equal to or greater than 10 to the 12th power m to the minus 3 power s to the minus one power will prevent significant electric field growth. DOE

N79-32775# Sandia Labs., Albuquerque, N. Mex.

SEISMIC DETERMINATION OF IMPACT TIMES OF SUPERSONIC PROJECTILES

T. L. Dobecki Jun. 1978 45 p ref
(Contract EY-76-C-04-0789)
(SAND-78-1077) Avail: NTIS HC A03/MF A01

A seismic system for detection and determination of impact times for supersonic projectiles was developed and tested. The study included: (1) a pretest seismic refraction survey to characterize subsurface conditions within the target area as well as (2) design and testing of the seismic detection array under test conditions. The refraction test indicated that operation of a geophone at minimum gain of 60 dB should allow good records of impacts at distances of 300 meters, at least. A further comparison test was derived by firing explosive charges near some impact craters and recording these with the array. The times were well within 10 millisecond accuracy. This technique was recommended for all future tests as the means of determining impact time. DOE

N79-32776# California Univ., Berkeley. Lawrence Berkeley Lab.

SPECTRAL MEASUREMENTS OF INFRARED SKY RADIANCE

P. Berdahl and M. Martin Jan. 1979 13 p refs Presented at 3d Natl. Passive Solar Conf., San Jose, Calif., 11 Jan. 1979
(Contract W-7405-eng-48)
(LBL-8778; Conf-790118-3) Avail: NTIS HC A02/MF A01

Measurements of the thermal infrared radiance of the sky are presented, showing the spectral distribution of radiation from the zenith. Samples of the data are compared with computer calculations for similar meteorological conditions. Computer calculations are based on the computer program LOWTRAN 3B. In general, the data confirm expectations that Tucson, with clear skies and dry air, is a good location for infrared radiative cooling systems. For an idealized selective surface at 25 C the average cooling rate would be 89 w/sq m in Tucson, and 65 w/sq m in San Antonio. If this idealized selective surface were allowed to cool down, it would reach an average temperature of -21 C in Tucson and -7 C in San Antonio. DOE

N79-32777# Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.

MEASUREMENT SYSTEM FOR LARGE MOTIONS

Roger Noyes, L. Davies, J. Kalinowski (EG and G., San Ramon, Calif.), and T. Stubbs (EG and G., San Ramon, Calif.) May 1979 18 p
(Contract EY-76-C-08-1183)
(EGG-1183-1634) Avail: NTIS HC A03/MF A01

The system used to measure the response of geologic media to stress waves generated during and after underground tests performed at the Nevada Test Site (NTS) was evaluated. Topics discussed include system transducers and accelerometers, the procedures used in calibrating and packaging the system, the positioning of equipment during fielding activities and the proceedures used to reduce and analyze the data recorded on magnetic tape during an underground nuclear explosion. DOE

N79-32778# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

NUMERICAL SOLUTION TO THE INVERSE PROBLEM OF THE GEODETIC ELLIPSOID OF REVOLUTION [DIE NUMERISCHE LOESUNG DER ZWEITEN GEODAETISCHEN HAUPTAUFGABE AUF DEM ROTATIONSELLIPSOID]

Dieter Ehlert 1978 59 p refs In GERMAN; ENGLISH summary
(Ser-B-228-Mitt-145) Avail: NTIS HC A04/MF A01

In conjunction with new developments in procedures for determining positions on the earth's surface and for navigation, the inverse problem is treated theoretically. Computer programs are presented that enable short, medium-long, and long geodesics to be determined. The corresponding source programs and reference lists are given in each case. A differential formulaic representation is then developed for geodesic lines.Author (ESA)

N79-32779# Preussag A.G., Erdoel und Erdgas, Hannover (West Germany).

IMPROVEMENT OF THE MVD METHOD (MIGRATION VELOCITY DETERMINATION) Final Report

Johan Sattlegger Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 116 p refs In GERMAN; ENGLISH summary Prepared in cooperation with Sattlegger Ingr. buero fuer Ange. Geophys.
(Contract BMFT-03E-3118-A/ETS-0003-A)
(BMFT-FB-T-78-30) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Ger. DM 24,40

The application of the notion of migration to seismic traces for the purpose of seismic velocity determination is examined. Accurate knowledge of seismic velocities is a prerequisite for good results in geophysical data processing as well as an important aid in the interpretation of a seismic section. The migration velocity determination method is applied to two and three-dimensional problems and a dip selective version is developed for complex cases with interfering events. The development is carried on with a computer method (ANAKON) which allows an improved velocity analysis for selected interfaces. First results of this last method are shown. Author (ESA)

N79-32780# National Physical Lab., Teddington (England). Div. of Quantum Metrology.

SPECTRAL LINESHAPE CALCULATION FOR A STRATOSPHERIC EMISSION MODEL

D. P. Rice Apr. 1979 17 p refs
(NPL-QU-50) Avail: NTIS HC A02/MF A01

A method of computing the Voigt line profile which is specifically designed for use in calculations of stratospheric emission is described. The method is accurate to one part in a thousand and is economical in computer time. The shape of a typical emission line of ozone at various altitudes in the atmosphere is calculated and displayed. A FORTRAN IV subroutine for use in computing the Voigt lineshape is included in the appendix. Author (ESA)

N79-32781# Academy of Sciences (USSR), Moscow. Inst. of Space Research.

THE MAGNETIC FIELD STRUCTURE ON THE MAGNETOSPHERE BOUNDARY

E. M. Dubinin, I. M. Podgorny, and Y. N. Potanin 1978 29 p refs
(PR-440) Avail: NTIS HC A03/MF A01

Magnetic field structure was studied on the day-side of the artificial magnetosphere formed by the interaction of the supersonic and superalfven collisionless plasma flow with the magnetic dipole. The plasma flow contained the intensity and direction controlled frozen-in magnetic field. It is shown that the magnetic curl at the dayside formed due to the reconnection of fields in the region of polar clefts and can disintegrate into smaller magnetic curls or islands. Simultaneous measurements with two magnetic probes made it possible to estimate the typical scale of such formations. The field structure on the boundary

is studied with the southern and northern components of the frozen-in magnetic field. A gradual turn of the magnetic field vector before the magnetopause was observed. Laboratory data are compared with the results obtained from space measurements as well as with various theoretical models and results are illustrated. Author (ESA)

N79-32782# Research Inst. of National Defence, Stockholm (Sweden).
SWEDISH EARTHQUAKES AND ACCELERATION PROBABILITIES
Ragnar Slunga Mar. 1979 46 p refs
(FOA-C-20295-E4) Avail: NTIS HC A03/MF A01

A method to assign probabilities to ground accelerations for Swedish sites is described. As hardly any nearfield data is available, the problem of interpreting macroseismic data in terms of acceleration is posed. Although the correlation between intensity and ground acceleration is poor, the large amount of data collected from several regions gives regression lines with small estimated uncertainties. However, application of these lines to regions of no such data is necessarily very uncertain. This cannot be avoided until relevant instrumental data becomes available. The macroseismic acceleration model as deduced gives epicentral ground acceleration of small Swedish earthquakes in agreement with existing distant instrument data. Author (ESA)

N79-32783# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
ELECTRIC FIELDS IN THE OUTER MAGNETOSPHERE: RECENT PROGRESS AND OUTSTANDING PROBLEMS
Carl-Gunne Faelthamur Mar. 1979 8 p refs Presented at Intern. Workshop on Selected Topics of Magnetospheric Phys., Tokyo, 12-16 Mar. 1979
(TRITA-EPP-79-03) Avail: NTIS HC A02/MF A01

The electric field is a crucial parameter in theories of solar wind interaction with the magnetosphere. Using experiments on board the satellites ISEE-1, GEOS 1, and GEOS 2 this parameter has, for the first time, been directly measured in the interacting regions: outer magnetosphere, magnetopause, magnetosheath, bow shock, and the adjacent solar wind. Among the first results are the verification of a large-scale dawn-to-dusk tangential electric field component at the magnetopause of typically 1 - 2 mV/m and a corresponding power dissipation of 50 W/sq km. The normal component of the electric field is typically of the same order of magnitude as the tangential component. Fine structure features, possibly related to the entry of plasma, remain to be analyzed. Author (ESA)

N79-32784# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
AN ELECTRIC CURRENT MODEL OF THE MAGNETOSPHERE
Hannes Alfven May 1979 26 p refs
(TRITA-EPP-79-09) Avail: NTIS HC A03/MF A01

A translation of the traditional field description of the magnetosphere into a particle (electric current) description is presented. Emphasis is placed on the energy transfer from the solar wind. The solar wind flow through the magnetic field acts as an electric generator. Its power is transferred to the magnetosphere through four main circuits. These are the magnetopause circuit, the solar wind-auroral circuit, the tail circuit, and the front circuit. A fifth circuit, the substorm circuit, is also discussed. When the tail circuit flares the current is partly redirected over the auroral zone, flowing in what is designated as the substorm circuit. Author (ESA)

N79-32785# Danish Meteorological Inst., Copenhagen.
THE RELATIONSHIP BETWEEN IONOSPHERIC AND FIELD ALIGNED CURRENTS IN THE DAYSIDE CUSP
J. Wilhjelm, E. Friis-Christensen, and T. A. Potemra (Johns Hopkins Univ., Laurel, Md.) 1978 30 p refs Submitted for publication
(DMI-Geophys-Papers-R-53; ISBN-87-7478-158-8) Avail: NTIS HC A03/MF A01

Observations of field-aligned currents determined from magnetic disturbances measured with the TRIAD satellite near local magnetic noon were compared to simultaneous magnetic perturbations observed at the ground with a dense chain of magnetic observatories located along the west coast of Greenland. The investigation reveals that the equivalent ionospheric currents at the dayside polar cusp are located between two field aligned current sheets, and the direction of the equivalent ionospheric current depends upon the directions of the two fields aligned currents in a manner consistent with the assumption that the equivalent ionospheric current represents an ionospheric Hall current. Author (ESA)

N79-32786# Danish Meteorological Inst., Copenhagen.
THULE GEOPHYSICAL OBSERVATORY: MAGNETIC RESULTS, 1950
1978 32 p refs
(ISBN-87-7478-135-9) Avail: NTIS HC A03/MF A01

Tables show hourly means of horizontal and vertical intensity and hourly means of magnetic declination. Diurnal extreme values and mean diurnal inequalities are also given. Author (ESA)

N79-32787# Danish Meteorological Inst., Copenhagen.
THULE GEOPHYSICAL OBSERVATORY: MAGNETIC RESULTS, 1951-1952
1978 47 p refs
(ISBN-87-7478-136-7) Avail: NTIS HC A03/MF A01

The results of the standard observation carried out at the Thule magnetic laboratory from 1951 to 1952 are presented. The measurements show hourly means of horizontal and vertical intensity and hourly means of magnetic declination. Diurnal extreme values and mean diurnal inequalities are also given. Author (ESA)

N79-32788# Danish Meteorological Inst., Copenhagen.
THULE GEOPHYSICAL OBSERVATIONS: MAGNETIC RESULTS, 1955-1956
1978 45 p refs
(ISBN-87-7478-137-5) Avail: NTIS HC A03/MF A01

The hourly means values of the horizontal and vertical intensity, and magnetic declination are presented in tables. A.R.H.

N79-32789# Danish Meteorological Inst., Copenhagen.
RUDE SKOV GEOPHYSICAL OBSERVATORY: MAGNETIC RESULTS, 1977
Axel Hansel 1978 42 p
(ISBN-87-7478-161-8) Avail: NTIS HC A03/MF A01

The results of the standard observations carried out at the Rude Skov magnetic laboratory during 1977 are presented. The measurements show hourly means of horizontal and vertical intensity and hourly means of magnetic declination. Diurnal extreme values and mean diurnal inequalities are also given. Author (ESA)

N79-32790# Stockholm Univ. (Sweden). Dept. of Meteorology.
A BULK MODEL OF THE ATMOSPHERIC PLANETARY BOUNDARY LAYER
Mohamed S. Smeda 2 May 1979 33 p refs Prepared in cooperation with Intern. Meteorol. Inst., Stockholm
(DM-28) Avail: NTIS HC A03/MF A01

The integrated momentum and thermodynamic equations for the planetary boundary layer (PBL) are solved numerically to predict the mean changes of wind and potential temperature from which surface fluxes are computed using bulk transfer coefficients of momentum and heat. The formulation and testing of a PBL height model based on the turbulent energy budget equation where turbulent fluxes of wind and heat are considered as the source of energy is described. The model exhibits the capability to predict the PBL height development for both stable and unstable regimes of observed conditions. Results of the model agree favorably with Deardorff's (1974) and Tennekes' (1973) models in convective conditions. Author (ESA)

N79-32791# Uppsala Ionospheric Observatory (Sweden).
LOWER IONOSPHERE ION PRODUCTION DENSITY AND COMPOSITION IN AN AURORAL ABSORPTION EVENT
L. G. Bjoern, F. Arnold (Max-Planck Inst. fuer Kernphys., Heidelberg), D. Krankowsky (Max-Planck Inst. fuer Kernphys., Heidelberg), B. Grandal (Norweg. Defence Res. Estab., Kjeller, Norway), O. Hagen (Norweg. Defence Res. Estab., Kjeller, Norway),

and E. V. Thrane (Norweg. Defence Res. Estab., Kjeller, Norway) 1978 22 p refs Sponsored by Swed. for Space Activities Submitted for publication
(UIO-SR-79-01) Avail: NTIS HC A02/MF A01

A payload instrumented to measure energetic particle precipitation, ionization density, and composition of ions as well as neutral constituents in the D and lower E regions was launched on February 21, 1976 from Esrange into an auroral absorption event. Energetic particles were measured in the spectral range 40 to 800 keV. The reported ion composition measurements were made during rocket ascent at an altitude of from 60 to 104.6 km. Water cluster ions dominated below, 71 km above which height NO was the most abundant ionic species. A concentration of negative ions was found at 74 km. The importance of the formation of these ions on the loss rate and recombination life time of positive cluster ions and hence on the positive ion composition is discussed. From the measured ion composition an altitude profile of nitric oxide is derived showing a concentration between 700 million/cucm and 300 million/cucm in the height range from 80 to 100 km. Author (ESA)

N79-32792# National Geodetic Survey, Rockville, Md.
GEODETIC BENCH MARKS
Richard P. Floyd Sep. 1978 58 p refs
(PB-296427/8; NOAA-M-NOS-NGS-1; NOAA-79043001) Avail: NTIS HC A04/MF A01 CSCL 08E

How and where to set bench marks for maximum stability is explained in this manual. Factors that affect vertical instability are discussed in detail. GRA

N79-32793# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
A CATALOG OF LOW-FREQUENCY OSCILLATIONS OF THE EARTH'S MAGNETIC FIELD AS OBSERVED AS SMS-2 AND GOES-2 DURING DECEMBER 1977
R. E. Newell and J. N. Barfield Oct. 1978 14 p refs
(PB-294327/2; NOAA-DR-ERL-SEL-2; NOAA-79031303) Avail: NTIS HC A02/MF A01 CSCL 04A

The SMS/GOES synchronous satellites were used to observe the earth's magnetosphere for information on magnetic pulsations at the earth's surface and in space in order to provide event by event comparison of the two. A table of low frequency magnetic oscillations from December, 1977, observed at the SMS/GOES locations is presented. A.W.H.

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N79-32794 Institut d'Aeronomie Spatiale de Belgique, Brussels.
THE EFFECT OF SOLAR OUTPUT, INFRARED COOLING AND LATITUDINAL HEAT TRANSPORT ON THE EVOLUTION OF THE EARTH'S CLIMATE
C. Nicolis 1979 19 p refs Submitted for publication
(Aeronomica-Acta-A-200-1979) Avail: Issuing Activity

An attempt is made to reconstruct some features of the past history of the earth's climate using a one dimensional planetary model. Starting at 250 million years ago to the beginning of the quaternary glaciation and taking into consideration the evolution of the sun's luminosity and paleoclimatic as well as geophysical data, possible evolutionary pathways are drawn. The main point of the results is that regardless of the details of the pathway followed, the infrared cooling coefficients and the heat transfer coefficient necessarily must have been evolving. Some arguments are advanced, determining the direction of the evolution. Author (ESA)

N79-32795 Institut d'Aeronomie Spatiale de Belgique, Brussels.
SOME EVOLUTION AND STABILITY TRENDS DEDUCED FROM ENERGY AND WATER VAPOR BALANCE MODELS
C. Nicolis 1979 24 p refs Presented at Intern. Conf. on Evolution of Planetary Atmos. and Climatol. of the Earth Submitted for publication
(Aeronomica-Acta-A-201-1979) Avail: Issuing Activity

A hierarchy of models of climatic evolution is considered. First, an energy balance model is used to analyze the influence of a systematic increase in the solar energy output over the last hundred million years. Plausible scenarios of the evolution of infrared cooling rates, of the heat transfer coefficient and of polar temperatures are constructed. Next, the dynamic coupling between humidity and temperature is represented using a two-variable planetary model. The stability properties of the steady-state climatic regime of the last 250 megayears are discussed both analytically and through numerical simulations. Author (ESA)

N79-32796*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE WAVE STRUCTURES OF THE EADY MODEL OF BAROCLINIC INSTABILITY
Jae Min Hyun and William W. Fowlis Washington Oct. 1979 26 p refs
(NASA-TP-1548) Avail: NTIS HC A03/MF A01 CSCL 04B

By solving the linear quasi-geostrophic set of equations pertinent to the Eady model, the complex eigenvalues and the eigenfunctions are obtained. The propagation speed and the growth rate are computed. Quantitative information is provided about the wave structures for several unstable models, a marginally stable mode, and a stable mode. The peculiarities concerning the amplitude and the phase variations of the waves are noted as the wavenumber varies from the unstable region to the stable region. Physical interpretations of the interrelationships among the dynamical variables are given, with a view toward revealing important aspects of the energy transfer from the basic state to the growing waves. A.R.H.

N79-32797*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EARTH RADIATION BUDGET SCIENCE, 1978
1978 79 p refs Workshop held at Williamsburg, Va., 28-30 Mar. 1978
(NASA-CP-2100) Avail: NTIS HC A05/MF A01 CSCL 04B

An earth radiation budget satellite system planned in order to understand climate on various temporal and spatial scales is considered. Topics discussed include: climate modeling, climate diagnostics, radiation modeling, radiation variability and correlation studies, cloudiness and the radiation budget, and radiation budget and related measurements in 1985 and beyond. For individual titles, see N79-32798 through N79-32804.

N79-32798*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EARTH RADIATION BUDGET SCIENCE, 1978. 1: INTRODUCTION
In its Earth Radiation Budget Sci., 1978 1978 p 1-3 (For primary document see N79-32797 23-47)
Avail: NTIS HC A05/MF A01 CSCL 04B

An earth radiation budget satellite system (ERBSS) is planned in order to understand climate on various temporal and spatial scales. The system consists of three satellites and is designed to obtain radiation budget data from the earth's surface. Among the topics discussed are the climate modeling and climate diagnostics, the applications of radiation modeling to ERBSS, and the influence of albedo clouds on radiation budget and atmospheric circulation. A.W.H.

N79-32799*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CLIMATE MODELING
In its Earth Radiation Budget Sci., 1978 1978 p 4-6 refs (For primary document see N79-32797 23-47)
Avail: NTIS HC A05/MF A01 CSCL 04B

The requirements for radiation measurements suitable for the understanding, improvement, and verification of models used in performing climate research are considered. Both zonal energy balance models and three dimensional general circulation models are considered, and certain problems are identified as common to all models. Areas of emphasis include regional energy balance observations, spectral band observations, cloud-radiation interaction, and the radiative properties of the earth's surface. A.W.H.

N79-32800*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CLIMATE DIAGNOSTICS
In its Earth Radiation Budget Sci., 1978 1978 p 7-14 ref (For primary document see N79-32797 23-47)
Avail: NTIS HC A05/MF A01 CSCL 04B

Diagnoses of climate fluctuations is examined emphasizing the assemblage of a host of observations, to develop a clearer physical picture of the nature and causal interrelationships of the climate events. Development of better statistical methods for making predictions of climate fluctuations and improving numerical climate prediction models is considered along with obtaining data for areas for which meager records exist such as the tropics and the southern hemisphere. The major circulation systems in the tropics, energy transports by the oceans and atmosphere, and the reflected or absorbed solar radiation values from the earth's surface are among the phenomena to be studied. A.W.H.

N79-32801*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RADIATION MODELING
In its Earth Radiation Budget Sci., 1978 1978 p 15-22 (For primary document see N79-32797 23-47)
Avail: NTIS HC A05/MF A01 CSCL 04B

Modelling of atmospheric effects in solar and terrestrial radiation regimes is discussed. Radiative effects of surfaces and the problem of data validation are also considered. K.L.

N79-32802*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RADIATION VARIABILITY AND CORRELATION STUDIES
In its Earth Radiation Budget Sci., 1978 1978 p 23-28 refs (For primary document see N79-32797 23-47)
Avail: NTIS HC A05/MF A01 CSCL 04B

The determination of variability of the emitted and reflected components of outgoing radiation from the earth-atmosphere system is discussed. The effects of variability on climate and weather are considered, and meteorological and climate variables to be correlated with radiation budget measurements are determined. K.L.

N79-32803*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CLOUDINESS AND THE RADIATION BUDGET
In its Earth Radiation Budget Sci., 1978 1978 p 29-33 (For primary document see N79-32797 23-47)
Avail: NTIS HC A05/MF A01 CSCL 04B

The problem of obtaining data for quantification of the effects of clouds on radiation budget measurements is discussed. Areas considered include the relationship between observed cloud characteristics and model predicted characteristics and selection of an angular distribution function for conversion of scanning radiometer radiance to irradiance. Storage of meteorological satellite data related to cloud-radiation interactions is discussed. K.L.

N79-32804*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RADIATION BUDGET AND RELATED MEASUREMENTS IN 1985 AND BEYOND
In its Earth Radiation Budget Sci., 1978 1978 p 34-46 (For primary document see N79-32797 23-47)
Avail: NTIS HC A05/MF A01 CSCL 04B

Development of systems for obtaining radiation budget and cloud data is discussed. Instruments for measuring total solar irradiance, total infrared flux, reflected solar flux, and cloud heights and properties are considered. Other topics discussed include sampling by multiple satellites, user identification, and determination of the parameters that need to be measured. K.L.

N79-32805# National Weather Service, Silver Spring, Md.
AVIATION AUTOMATED WEATHER OBSERVATION SYSTEM (AV-AWOS) Final Report
Mar. 1979 124 p refs
(Contract DOT-FA73WAI-384; FAA Proj. 153-451)
(AD-A072119; FAA-RD-79-63) Avail: NTIS HC A06/MF A01 CSCL 04B

The test results of the Aviation Automated Weather Observation System (AV-AWOS) at Newport News, Virginia, are presented. The rationale for the cloud and visibility algorithms is discussed. Verification of these algorithms is presented. The algorithms for converting sensor data to automated observations of cloud height, sky cover, and visibility are specified. Tabulation of the user reactions to an automated observation is presented. Author

N79-32806# Air Weather Service, Scott AFB, Ill.
PROCEEDINGS OF THE 8TH TECHNICAL EXCHANGE CONFERENCE
May 1979 271 p refs Conf. held at Air Force Academy, Colo., 28 Nov. - 1 Dec. 1978
(AD-A070009; AWS/TR-79/001) Avail: NTIS HC A12/MF A01 CSCL 04/2

Full length or abbreviated reports of 48 presentations at the Eighth Technical Exchange Conference, held at the USAF Academy, Colorado, 28 November through 1 December 1978 are presented. Session topics were Automated Observing and Forecasting, Atmospheric Propagation, Climatological Modeling, Tailored Environmental Support and Scientific Surveys. Author (GRA)

N79-32807# Naval Postgraduate School, Monterey, Calif.
USE OF GALERKIN METHODS IN NUMERICAL WEATHER PREDICTION Technical Report, Oct. 1977 - Dec. 1978
R. T. Williams Dec. 1978 53 p refs
(AD-A070458; NPS63-78-006) Avail: NTIS HC A04/MF A01 CSCL 04/2

In this report the Galerkin method is presented and the spectral and finite element methods are shown to be special cases of the general method. The spectral and finite element methods are applied to a simple linear equation and compared. The spectral method is then applied to the nonlinear barotropic vorticity equation in Cartesian coordinates and in spherical coordinates. The transform technique is presented which allows efficient treatment of the nonlinear terms in the spectral method. This method is also applied to the shallow water equations. The finite element method with linear basis functions is applied to the linear advection equation and compared to second and fourth order finite difference approximations. The nonlinear barotropic vorticity is also developed in finite elements. GRA

N79-32808# Army Electronics Research and Development Command, White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.
METEOROLOGICAL ROCKET NETWORK SYSTEM RELIABILITY
Bruce W. Kennedy and Jose M. Serna Mar. 1979 77 p refs
(DA Troj. 1T6-65702-D-127)
(AD-A070187; ERADCOM/ASL-TR-0028) Avail: NTIS HC A05/MF A01 CSCL 04/1

This report describes procedures used to determine meteorological rocket system reliability throughout the Meteorological Rocket Network. It discusses the reasons for implementing the program, provides examples of output, identifies problem areas, and includes samples of monthly and cumulative results. Also included are procedures for reporting failures, a glossary of failure modes, instructions for implementing the program on a UNIVAC 1108 computer, and a tabulated list of the computer program. Author (GRA)

N79-32809# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.
THE 14818C LANCE, MISSILE NUMBER 3398, ROUND NO. 328 APT Meteorological Data Report
Apr. 1979 27 p
(DA Proj. 1P6-65702-D-127)
(AD-A070489; ECOM-DR-997) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 14818 C Lance, Missile Number 3398, Round Number 328 Apt, are presented in tabular form. Author (GRA)

N79-32810# Naval Postgraduate School, Monterey, Calif.
STATISTICAL ADJUSTMENT OF DYNAMICAL TROPICAL CYCLONE MODEL TRACK PREDICTIONS M.S. Thesis

Dennis Robert Frill Mar. 1979 91 p refs
(AD-A070094) Avail: NTIS HC A05/MF A01 CSCL 04/2

A technique of statistically adjusting dynamical forecasts of tropical cyclone motion was tested. All tests were performed with operationally-analyzed data from the U.S. Navy Fleet Numerical Weather Central (FNWC). Three sets of regression equations were developed to modify forecasts of typhoon tracks. The first set of equations was based only on forward integration of the FNWC Tropical Cyclone Model (TCM) for 28 cases in 1975-76. An independent sample of cases from 1977-78 indicated that the first equation set was based on too small a sample size, especially considering the anomalous nature of the 1975-76 storm tracks. A second equation set based only on forward integration of the TCM was derived from 61 storm track forecasts from 1975-78. Results from the experiments with these equations indicate that systematic data and model errors can be used to statistically adjust forecast storm tracks. The second equation set based on forward integration showed improvement over the unmodified model predictions at all forecast times. A third equation set based on forward and backward integration of the TCM explained the greatest amount of variance of all the equation sets. GRA

N79-32811# Sandia Labs., Albuquerque, N. Mex.
WIND POWER CLIMATOLOGY OF THE UNITED STATES, SUPPLEMENT
Jack W. Reed Apr. 1979 85 p refs
(Contract AC-04-76-DP-00789)
(SAND-78-1620) Avail: NTIS HC A05/MF A01

The summaries in the earlier Wind Power Climatology of the United States are extended to include monthly and annual average wind speeds. Station histories that allow adjustment for local air density, based on station pressure-altitude and the annual temperature cycle, were obtained from the National Climatic Center. The logs of anemometer exposures were used to adjust both wind speeds and wind powers to standard height, 10 m above ground. Extrapolations for speed and power at 20- and 50-m heights are also provided. DOE

N79-32812# Oak Ridge National Lab., Tenn.
METEOROLOGICAL EFFECTS OF THERMAL ENERGY RELEASES (METER) PROGRAM Annual Progress Report, Oct. 1976 - Sep. 1977
A. A. Patrinos, Comp. and H. W. Hoffman, Comp. Aug. 1978 320 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6248) Avail: NTIS HC A14/MF A01

Twelve articles are presented dealing with the evaluation of heat dissipation systems and their climatic/meteorologic effects. Some of the effects discussed include: drift transport and deposition, precipitation augmentation, fog and icing, and cloud development. DOE

N79-32813# Danish Meteorological Inst., Copenhagen.
SUMMARIES OF WEATHER OBSERVATORIES AT WEATHER STATIONS IN GREENLAND FROM 1966 TO 1970
1978 216 p refs
(ISBN-87-7478-156-1) Avail: NTIS HC A10/MF A01

Meteorological statistics covering the period 1966 to 1970 were working out using electronic data processing of synoptic surface observations made at 26 weather stations in Greenland. The stations geographical positions and hours of observations are given. The statistics are presented as tables which comprise data on wind speed and direction as well as frequency of surface wind. Data on visibility ranges, cloud ceilings, and the number of occurances of fog, precipitation, blowing snow, and thunderstorms are also shown. The number of occurances of specified values of surface temperatures, specified values of surface minimum and maximum temperatures as well as data on average mean sea level are also tabulated. Author (ESA)

N79-32814# National Hurricane Center, Coral Gables, Fla.
MODIFICATION OF NMC ANALYSES AND PROGNOSES FOR USE IN STATISTICAL TROPICAL CYCLONE PREDICTION MODELS
Preston W. Leftwich May 1979 22 p refs
(PB-297190/1; NOAA-TM-NWS-NHC-12; NOAA-79051104) Avail: NTIS HC A02/MF A01 CSCL 04B

A procedure was developed to generate geopotential heights at 500 and 700 mb for use in statistical synoptic tropical cyclone prediction models. Geopotential heights are obtained from predicted and analyzed winds by use of a derived balance equation. Such generated heights reduced biases previously observed in the spectral analyses. Generated large scale height patterns portrayed a steering relationship between wind and height better than the operational analyses. Predictions made with the models for the 1978 Atlantic and Eastern Pacific tropical cyclone seasons generally gave lower mean vector errors than operational forecasts. A.W.H.

N79-32815# National Weather Service, Silver Spring, Md.
INTERDURATION PRECIPITATION RELATIONS FOR STORMS: SOUTHEAST STATES
Ralph H. Frederick Mar. 1979 72 p refs Sponsored in part by Soil Conservation Service
(PB-297192/7; NOAA-TR-NWS-21; NOAA-79051506) Avail: NTIS HC A04/MF A01 CSCL 04B

Annual maximum precipitation events for N = 1, 2, 3, 6, 12, and 24 hr durations are identified. The precipitation event for each of M = 1, 2, 3, 6, 12, and 24 hr duration (M not equal to N) concurrent with the N-hr event is then selected. The events are stratified according to magnitude and relations between the N-hr and M-hr event are studied by forming a ratio of shorter to longer duration precipitation totals. Accumulated frequency distributions of this rain by duration and return period class interval are suggested as a tool to estimate precipitation increments in constructing precipitation mass curves. By analyzing the relative timing of the shorter duration within the larger duration event a characteristic time distribution can be developed. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N79-32816 Texas A&M Univ., College Station.
FRONTAL DYNAMICS OF A GULF STREAM RING Ph.D. Thesis
Donald Bruce Olson 1979 168 p
Avail: Univ. Microfilms Order No. 7919094

Hydrographic data and an expendable bathythermograph survey are used to study the dynamics of a Gulf Stream cyclonic ring over a period of four months. The ring vorticity balance under the gradient current approximation, ring energetics, and the three dimensional structure of perturbations to a symmetric ring are examined. The ring has a frontal layer comparable to strong mid/tropospheric fronts in the atmosphere that persists over the entire four month period. Consideration of potential vorticity conservation indicates that the frontal layer with its potential vorticity maxima is of major importance to the longevity of T-S anomalies in the ring core. Energy calculations lead to the conclusion that a flux of available potential energy occurs across the frontal layer and that this flux of energy is accounted for in terms of the presence of waves superimposed on the ring. Dissert. Abstr.

N79-32817 South Carolina Univ., Columbia.
SUSPENDED SEDIMENT IN BREAKING WAVES Ph.D. Thesis
Timothy William Kana 1979 160 p
Avail: Univ. Microfilms Order No. 7920046

Suspended sediment concentration was measured in 235 breaking waves on undeveloped beaches near Price Inlet, South Carolina, U.S.A., using portable in situ bulk water samplers. The factors which control the distribution of suspended sediment in the breaker zone are determined. Concentrations of suspended sediment were determined at fixed intervals of 10, 30, 60 and 100 cm above the bed for various surf zone positions relative to the breakpoint. Although the amount of variation in mean concentration accounted for only ranges up to 65%, these data support the notion that sediment suspension in the surf zone is statistically predictable. The importance of breaker type on concentration suggests that transport of sand in the surf zone

is less dependent on wave height and wave steepness than on relative wave height. Dissert. Abstr.

N79-32818# Smithsonian Astrophysical Observatory, Cambridge, Mass.
INVESTIGATION OF THE LONG-WAVELENGTH GRAVITY FIELD OF THE OCEANS
Micheline C. Roufosse Hanscom AFB, Mass. AFGL Oct. 1978 23 p refs
(Contract F19628-78-C-0003)
(AD-A064662; AFGL-TR-78-0271; SR-1) Avail: NTIS HC A02/MF A01 CSCL 08/3

The correlation between the short wavelength features contained in the gravity and topographic height fields were studied statistically. It is found that the slope of linear regression between the two fields varies with the age of the basement rocks. This observation is in qualitative agreement with the variations of P-wave velocity anomalies with tectonic classes. These results were compared with a thermal model for the continental lithosphere. The geoid heights derived from the GEOS-3 altimeter data were also studied. Two methods are being developed in order to interpret the whole range of signals contained in the geoid heights. G.Y.

N79-32819# Max-Planck-Institut fuer Meteorologie, Hamburg (West Germany).
OCEAN WAVE FORECASTING Report, Sep. 1977 - Dec. 1978
Klaus Hasselmann Dec. 1978 3 p
(Contract N00014-77-G-0054)
(AD-A069469) Avail: NTIS HC A02/MF A01 CSCL 04/2

The purpose of this research was to develop a general numerical program for integrating the Boltzman integral representing the third-order nonlinear energy transfer in a surface-wave spectrum. As described, the research proposal, a detailed study of the nonlinear energy transfer, is an essential first step for developing realistic numerical wave prediction models, since it has been established in a number of recent field experiments that the nonlinear transfer has a strong influence on the shape and evolution of a growing wind-sea spectrum. Existing integration programs are computationally expensive and not sufficiently general to treat an arbitary wave spectrum with frequency dependent, asymmetric directional spreading functions. The purpose of the research was therefore to develop a more efficient, general integration method which could be used for extensive numerical experiments. GRA

N79-32820# Sandia Labs., Albuquerque, N. Mex.
DEVELOPMENT OF MULTIFUNCTIONAL SEA-FLOOR INSTRUMENTAL SYSTEMS
E. W. Reece and H. M. Stoller 1978 34 p refs Presented at the 13th Intersoc. Energy Conversion Eng. Conf., San Diego, Calif., 20 Aug. 1978
(Contract EY-76-C-04-0789)
(SAND-78-0781C; Conf-780801-4) Avail: NTIS HC A03/MF A01

Unique instrumentation systems developed to assist both government and industry to characterize the geotechnical environment of the outer continental shelf are described. A high data rate acoustic telemetry system together with microcomputer controlled data acquisition processing and storage capability is included. A seafloor earthquake measurement system, a geotechnically instrumented seafloor probe to assess the mudslide potential submarine sediments, and a marine sediment penetrometer to provide shallow sediment strength profiles are discussed. DOE

N79-32821# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
WINTER CIRCULATION AND HYDROGRAPHY OVER THE CONTINENTAL SHELF OF THE NORTH GULF OF ALASKA
J. D. Schumacher, R. Sillcox, D. Dreves, and R. D. Muench Aug. 1978 22 p refs
(PB-296914/5; NOAA-TR-ERL-404; PMEL-31; NOAA-79051603) Avail: NTIS HC A02/MF A01 CSCL 08C

Temperatures and salinity were measured in the shelf region east of Kodiak Island and in the Shelikof Strait. Two subsurface cores of warm, saline water were observed; one was coincident with the shelf break and one extended northwestward from the break into the Amatuli Trough. The temperatures characteristic of these cores indicated that they were nonlocal, advective features perhaps originating in the Alaska current and that they reflected a bifurcation of this flow upstream. Current records for Shelikof Strait showed a strong southwesterly flow with no reversals, which suggested a barotropic component driven by an axial pressure difference and resulting in hydraulic flow. The forcing by the Alaska current was augmented by a weak westward baroclinic flow resulting from local freshwater input. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N79-32822*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MICROBIOLOGICAL EVALUATION OF THE MOBILE BIOLOGICAL ISOLATOR SYSTEM
Daniel M. Taylor, Frank Morelli, William Neiderheiser, and Wallace M. Tratz 1 Jul. 1979 61 p refs
(Contract NAS7-100)
(NASA-CR-162293; JPL-Pub-79-48) Avail: NTIS HC A04/MF A01 CSCL 06C

Evaluations on critical components of the mobile biological isolation system were performed. High efficiency particulate air filter efficiency and suit integrity were found to withstand repeated ethylene oxide (ETO) sterilizations. The minimum ETO sterilization time required to inactivate all contaminant organisms was established at four hours. Two days of aerating at 120 F was found to dissipate all harmful ETO residuals from the suit. Donning and doffing procedures were clarified and written specifically for isolation rooms. Author

N79-32823# Missouri Univ. - Columbia. Dept. of Veterinary Microbiology.
MECHANISMS OF OXYGEN TOXICITY AT THE CELLULAR LEVEL Annual Status Report, Jan. 1978
Olen R. Brown, Laurie Foudin, Fred Yein, Patti Gilliland, Richard Seither, and Doris Song 1 Jan. 1978 16 p refs
(Contract N00014-76-C-0328; NR Proj. 204-020)
(AD-A070026; Rept-32) Avail: NTIS HC A02/MF A01 CSCL 06/20

Oxygen at elevated pressures is toxic for life forms from microbes to man. Growth is inhibited in Escherichia coli and results primarily from poisoning of specific enzymes in the following biosynthetic pathways branched-chain and aromatic amino acids, NAD-niacin, phosphoribosylpyrosphosphate PRPP and reverse glycolysis. Inhibition of amino acid biosynthesis indirectly stops protein synthesis and induces 'stringency' production of pp-guainine-pp, a powerful inhibitor of metabolic processes which accounts for inhibition in metabolic processes where there is no observed enzymatic poisoning. Inhibitions in the PRPP, NAD-niacin, and reverse glycolysis pathways are significant to bacterial and perhps to human oxygen toxicity where products of the pathways protect. Author (GRA)

N79-32824# Ohio State Univ., Columbus. Dept. of Statistics.
ESTIMATION OF RATE CONSTANTS IN THE MICHAELIS-MENTEN MODEL
J. S. Rustagi and Joanne Yang Mar. 1979 18 p refs
(Contract N00014-78-C-0543)
(AD-A070360; TR-177) Avail: NTIS HC A02/MF A01 CSCL 12/1

Nonlinear models leading to the Michaelis-Menten scheme result from the study compartment systems as well as in other contexts. Using difference equation approach, rate constants are estimated in some simple models. Simulation methods are used to derive the distributions of these estimates. It is shown that the assumptions of normality of errors leads to the normal distribution of the estimated rate constants. Author (GRA)

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N79-32825 Pennsylvania Univ., Philadelphia.
OXYGEN DELIVERY IN THE HYPOXIC PERFUSED HEART: RELATION TO FUNCTIONAL AND METABOLIC CHANGES Ph.D. Thesis
Charles Steenbergen 1979 261 p
Avail: Univ. Microfilms Order No. 7919520

It is recognized that the distribution of oxygen delivery is markedly altered by local vascular changes in the absence of any physical impediment to flow, and that local vascular control mechanisms result in decreased coronary perfusion into small areas of tissue. The contribution of these mechanisms to ischemia induced changes in contractility and metabolism is assessed utilizing NADH fluorescence photography. Results indicate (1) during ischemia, there is a parallel decline in effluent pH, intracellular pH, and pressure development; (2) the negative inotropic effect of ischemia is primarily due to acid accumulation despite the presence of relatively nonfunctioning, anoxic cells; and (3) decreased intracellular pH in the aerobic tissue does not substantially diminish high energy phosphate reserves, while in the anoxic tissue, high energy phosphate levels decline rapidly. Dissert. Abstr.

N79-32826# Illinois Univ. at Chicago Circle, Chicago. Dept. of Materials Engineering.
REFINEMENT AND VALIDATION OF A THREE-DIMENSIONAL HEAD-SPIN MODEL Final Report, 1 Jan. 1976 - 31 Dec. 1977
T. Belytschko and E. Privitzer Wright-Patterson AFB, Ohio AMRL Aug. 1978 162 p refs
(Contract F33615-76-C-0506)
(AD-A062502; AMRL-TR-78-7) Avail: NTIS HC A07/MF A01 CSCL 06/16

Four models of varying orders of complexity were developed, ranging from a complex model with 252 degrees of freedom to a vary simplified model with 32 degrees of freedom. Comparisons of the impedance curves of the models with experimentally developed curves show good agreement, both in the magnitudes and locations of peaks. Furthermore, by varying the components of the model it was shown that the primary peaks in the impedance curve in the 5 to 7 Hz range result from a combination of buttock-seat resonance, the flexural response of the spine and visceral resonance. Analogous head-spin models were developed for the chimpanzee, baboon, and rhesus monkey. Impedance curves are presented for these models and show significant differences in character from that of the human spine models. Model studies are presented for ejection loading and for pre-ejection alignment by an inertial reel. The influence of various parameters, such as head position and the restraint system properties, were studied. Author

N79-32827# Department of Energy, Washington, D. C.
METHODS FOR STUDYING AND CRITERIA FOR EVALUATING THE BIOLOGICAL EFFECTS OF ELECTRIC FIELDS OF INDUSTRIAL FREQUENCY
B. M. Savin, M. G. Shandala, K. V. Nikonova, and Yu. A. Morozov 1978 24 p refs Presented at Criteria for Evaluating the Biological Efforts, Paskeut, USSR, 15 May 1978
(CONF-780541-1) Avail: NTIS HC A02/MF A01

Data are reviewed from a number of U.S.S.R. research studies on the biological effects of electric power transmission lines of 1150 Kv and above. Effects on man, plants, animals, and terrestrial ecosystems are reported. Existing health standards in the U.S.S.R. for the exposure of personnel working in electric fields are included. It is concluded that high voltage electric fields have a harmful effect on man and his environment. DOE

N79-32828# Battelle Pacific Northwest Labs., Richland, Wash.
REVIEW OF UNFOLDING METHODS USED IN THE US AND THEIR STANDARDIZATION FOR DOSIMETRY
C. A. Oster [1979] 20 p refs Presented at the 2nd ASTM-EURATOM Symp. on Reactor Dosimetry: Dosimetry Methods for Fuels, Cladding and Structural Mater., Palo Alto, Calif., 3-7 Oct. 1977
(Contract EY-76-C-06-1830)
(BNWL-SA-6503; Conf-771036-17) Avail: NTIS HC A02/MF A01

A summary of the methods used in the U.S. to unfold radiation spectra is given. For discussion purposes, the methods studied are placed in groups, based on the algorithm used for unfolding and/or treatment of data uncertainties. Specific codes from each group are selected and examined for their role in dosimetry standardization. Finally, the preparation of the ASTM recommended practices and use of benchmark problems in the standardization process are discussed. DOE

N79-32829# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
EFFECTS OF ACUTE NOISE TRAUMATA ON WHOLE-NERVE AND SINGLE-UNIT ACTIVITY
G. F. Smoorenburg and E. vanHeusden 1978 12 p refs Presented at 15th Workshop on Inner Ear Biol., Seefeld, Austria, Sep. 1978
(IZF-1978-23; TDCK-71654) Avail: NTIS HC A02/MF A01

Some preliminary results of a research program on the effects of noise traumata on cochlear functioning are given. Measurements reported include the latency of the whole-nerve (compound) action potential (AP), the selectivity of frequency-tuning curves (e.g. the Q10-values) measured for the AP (with a forward-masking technique) and for single units in the antero-ventral cochlear nucleus, the degree of phase-locking of the action potentials of these units to the stimulus waveform, and the phase of the stimulus waveform to which these potentials are locked. The noise traumata were induced during the experiments. Results show that the AP latency increases after inducement of a noise trauma if the stimulus is presented at the same sound pressure level as before the trauma. An effect of the noise trauma on Q10 values, although small, can be measured. Neither the AP latency data nor the response times calculated from single-unit data suggest that a decrease in the sharpness of tuning found after inducement of noise trauma is accompanied by a decrease of cochlear response times. Author (ESA)

N79-32830# National Technical Information Service, Springfield, Va.
HYPOTHERMIA. A BIBLIOGRAPHY WITH ABSTRACTS Report, 1964 - May 1979
Elizabeth A. Harrison Jun. 1979 246 p Supersedes NTIS/PS-78/0517; NTIS/PS-77/0419; NTIS/PS-76/0398
(NTIS/PS-79/0533/4; NTIS/PS-78/0517; NTIS/PS-77/0419; NTIS/PS-76/0398) Avail: NTIS HC $28.00/MF $28.00 CSCL 06S

The selected abstracts cover high pressure narcosis, organ preservation, hyperbaric conditions, thermal homeostasis, thermoregulation, cold stress, cold tolerance, physiological effects and cold water immersion as related to hypothermia. (This updated bibliography contains 238 abstracts, 12 of which are new entries to the previous edition.) GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N79-32831# Naval Aerospace Medical Research Lab., Pensacola, Fla.
HUMAN PERFORMANCE IN TIME-SHARED VERBAL AND TRACKING TASKS Interim Report
Steven D. Harris, Jerry M. Owens, and Robert A. North Apr. 1979 27 p refs
(ZF5154004)
(AD-A070275; NAMRL-1259) Avail: NTIS HC A03/MF A01 CSCL 17/2

Significant progress has been made in the development of automated speech understanding systems for application to naval aviation systems. One advantage that is anticipated for speech over conventional man-machine interfaces is that speech could function as an independent channel for the control of systems.

The experiment reported in this paper represents an initial effort to investigate the assumption that an automatic speech understanding system will provide a parallel channel for the performance of an information processing task currently with a visual/manual control task. The experiment required human subjects to time-share a digital information processing task and a continuous compensatory tracking task. Independent variables in the design were task loading (single- vs. dual-task conditions), stimulus presentation modality for the digital task (auditory vs. visual), and response modality for the digital task (voice vs. keyboard). Data from 16 subjects were analyzed. The results indicated that the combination of visual stimulus modality and voice response provided optimum joint-task performance. No combination of stimulus and response modalities resulted in equivalent single- and dual-task performance. Future experiments should be designed to investigate the joint-task performance space for tasks that are more representative of the information processing performance requirements of specific systems. However, the interpretability of the results of such research will depend upon the solution of methodological problems, such as how to control or account for subjects' speed-accuracy tradeoff strategies and the priorities they place upon the concurrent tasks. GRA

N79-32832# Air Force Human Resources Lab., Brooks AFB, Tex.

PILOT PERFORMANCE IN SIMULATED AERIAL REFUELING AS A FUNCTION OF TANKER MODEL COMPLEXITY AND VISUAL DISPLAY FIELD-OF-VIEW Final Report, Oct. 1977 - Feb. 1978

Robert R. Woodruff, Thomas M. Longridge, Jr., Philip A. Irish, III, and Richard T. Jeffreys May 1979 25 p refs
(AF Proj. 1123)
(AD-A070231; AFHRL-TR-78-98) Avail: NTIS HC A02/MF A01 CSCL 05/9

This research was conducted in the Advanced Simulator for Pilot Training (ASPT) to determine Computer Image Generation (CIG) complexity and field-of-view (FOV) requirements for aerial refueling (AR). The adequacy of three detail levels and five FOVs was assessed. Aircraft simulated, in addition to the KC-135 tanker, were the A-10, F-4, B-52, and F/FB-111. Twelve experienced pilots (three per aircraft) served as subjects. Performance measures included elapsed time to criterion, number of disconnects and aircraft control profile. An assessment of FOV position employed for takeoff/landing versus AR was also made. A-10 and F-4 pilots found the visual FOV position employed for simulated takeoff/landing must be raised approximately 12 degrees to accomplish AR. B-52 and F-111 pilots found AR could be satisfactorily performed using the same FOV position employed for takeoff/landing. Performance measures clearly indicated that AR performance varies as a function of both FOV size and tanker detail level. The larger the FOV, the better the performance. Similarly, the more detailed the tanker model, the better the performance. GRA

N79-32833# Catholic Univ. of America, Washington, D. C. Dept. of Psychology.

A COMPARISON OF VERBAL AND VISUAL IMAGERY LEARNING STATEGIES: THEIR IMPORTANCE FOR INSTRUMENTAL TECHNOLOGY Final Report, Jan. 1976 Dec. 1978

Forrest R. Ratliff, James A. Earles, James D. Ratliff, and Dale Wissman 1 Dec. 1978 214 p refs
(Grant AF-AFOSR-2973-76; AF Proj. 2313)
(AD-A069983; AFOSR-79-0673TR) Avail: NTIS HC A10/MF A01 CSCL 05/10

Two learning experiments were conducted to compare verbal and imagery based encoding techniques. Experiment 1 was conducted under rigorously controlled conditions comparing four encoding methods, and Experiment 2 compared the imagery matrix and eclectic verbal encoding in a classroom environment. The results showed the imagery matrix to be superior to all other methods and imagery based methods were superior over all to verbally mediated methods. The imagery matrix is suitable for use in an instructional technology. Author (GRA)

N79-32834# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

PERFORMANCE AND WORKLOAD ANALYSIS OF INFLIGHT HELICOPTER MISSIONS

P. H. Wewerinke 10 Apr. 1979 34 p refs Presented at 13th Ann. Conf. on Manual Control, Cambridge, Mass., 15-17 Jun. 1979 Sponsored by Res. Branch of the Directorate of Mat. Air RNLAF
(NLR-MP-77013-U) Avail: NTIS HC A03/MF A01

The potentials of an optimal control model for predicting the characteristics of realistic operational helicopter missions were assessed. The theoretical and experimental results indicate that the optimal control model succesfully predicts the best attainable (rather than the average) performance of a group of well-trained, highly motivated subjects. Furthermore, the model allows a description of inter-subject variability. The control effort model predictions are supported by subjective ratings. The model provides a meaningful representation of pilot workload relative to complex control tasks. Author (ESA)

N79-32835# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

A THEORETICAL AND EXPERIMENTAL ANALYSIS OF THE OUTSIDE WORLD PERCEPTION PROCESS

P. H. Wewerinke 15 Jun. 1978 23 p refs Presented at 14th Ann. Conf. on Manual Control, Los Angeles, 25-27 Apr. 1978
(NLR-MP-78020-U) Avail: NTIS HC A02/MF A01

The outside scene is often an important source of information for manual control tasks. Important examples of this are car driving and aircraft control. The modeling for this visual scene perception process on the basis of linear perspective geometry and the relative motion cues is discussed. Model predictions, utilizing psychophysical threshold data from baseline experiments and literature on a variety of visual approach tasks, are compared with experimental data. Both the performance and workload results illustrate that the model provides a meaningful description of the outside world perception process, with a useful predictive capability. Author (ESA)

N79-32836# Research Inst. of National Defence, Stockholm (Sweden).

SHALIT PERCEPTUAL ORGANIZATION AND REDUCTION QUESTIONNAIRE (SPORQ). REPORT 2: CHARACTERISTICS AND RELIABILITY

Ben Shalit May 1979 73 p refs
(FOA-C-55031-H6) Avail: NTIS HC A04/MF A01

The characteristics and reliability of the Shalit Perceptual Organization and Reduction Questionnaire are examined. The population to which the test was applied consisted of three main groups: national servicemen-conscripts (N=201), professional soldiers (N=383), and civilians (N=145). Each of these were further subdivided into four groups representing various types of occupations or units. The distributions of their scores (structural - quantitative and content - qualitative) are analyzed and discussed. An analysis of structure and interrelationships between the elements of the test was made and a mapping sentence formulated. Test scoring reliability and test-retest reliability was also investigated. The test was shown to have good overall scoring and retest reliabilities, ranging from .70 to .98 and from .56 to .98, respectively. Author (ESA)

N79-32837# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

THE USE OF ARTIFICIAL SIGNALS DURING SONAR-WATCH

W. A. Wagenaar and A. F. Sanders 1978 7 p
(IZF-1978-25; TDCK-71719) Avail: NTIS HC A02/MF A01

The detection of submarines using CW 610 sonar on board Van Speyk class frigates was evaluated and found to be less than optimal. This loss in detection efficiency is attributed to degradation in operator's vigilance. As a possible solution to the vigilance problem operators were required to monitor the screen only for a short period of time (20 to 30 minutes) after which they either relaxed, or worked on something else, for the same length of time. However, laboratory experiments show that if the rest period is also rather unstimulating alertness is not improved. As an alternative, the frequent presentation of artificial signals, or echoes (without the operator knowing when or where such a signal will occur) was tried and knowledge of results about the detection of these artifical signals was provided to

him. Results show that real signals are detected better under such circumstances and, moreover, that lapses of attention are counteracted. Author (ESA)

N79-32838# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
CAR DRIVING AS A CYBERNETIC TASK
G. J. Blaauw 1979 71 p refs In DUTCH; ENGLISH summary
(IZF-1979-6; TDCK-71982) Avail: NTIS HC A04/MF A01

The possibilities of cybernetics in analyzing driver's behavior quantitatively are evaluated. Several task analyses of driving are surveyed. The results of this survey are used systematically in presenting the available cybernetic models of driving. The cybernetic models of driving are grouped with respect to the number of input signals (as related to driver's search) and to the implementation of future information of signals (as related to driver's prediction). Models are described for lateral control as well as longitudinal control (car following). Models are not yet available for combinations of driving tasks. The representation consists of an estimated value and an uncertainty around the estimate for each state. Both values for all states initiate (1) an increase in attention to any state for which the uncertainty becomes too high, and (2) the execution of control actions. This model structure permits an analysis of the multivariable driving task in terms of supervisory control. As a result, driver's internal criterion can be determined in relation to driving experience, among other things. Author (ESA)

N79-32839# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
EFFECTS OF AMPHETAMINE ON RESPONSE SELECTION AND RESPONSE EXECUTION PROCESSES IN CHOICE REACTION TASKS
H. W. Frowein 1979 27 p refs Sponsored by Found. for Med. Res. FUNGO
(IZF-1978-8; TDCK-71983) Avail: NTIS HC A03/MF A01

Two experiments to investigate the effect of an amphetamine derivative (phentermine HCL) on different stages in the reaction process were carried out. Experiment 1 showed that amphetamine shortened the reaction time, but this effect was additive with the effects of relative signal frequency and stimulus-response compatibility, which suggests that the amphetamine effect on the reaction time cannot be attributed to a specific effect on the response selection stage. Experiment 2 showed that amphetamine shortened the movement time in a target-aiming task. This effect was greater for longer movements but independant of target width, which suggests that amphetamine specifically affects the motor processes involved in the execution of aiming responses, but that the visual feedback processes during the movements were not affected by amphetamine. In addition, Experiment 2 showed an effect of amphetamine on the reaction time which was interpreted in terms of an amphetamine effect on the preparatory motor processes proceeding the aiming response. These findings are consistent with findings in the literature suggesting effects of amphetamine in motor tasks rather than in cognitive and perceptual tasks. Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N79-32840# Houston Univ., Tex.
APPLICATION OF A STRUCTURED DECISION PROCESS FOR PROPER INCLUSION OF HUMAN RESOURCES IN THE DESIGN OF A POWER UNIT SUPPORT STAND Interim Technical Report, 1 Sep. 1977 - 30 Sep. 1978
Benjamin Ostrofsky Sep. 1978 67 p refs
(Contract F49620-77-C-0116; AF Proj. 2313)
(AD-A069978; AFOSR-79-0669TR) Avail: NTIS HC A04/MF A01 CSCL 01/5

A structured design process was applied to the design of the F-16 Aircraft Emergency Power Unit (EPU) Service Stand. Explicit steps in the accomplishment of a set of candidate systems, development of a multi-attribute criteria function along with the attendant parameters and their feasible ranges, and the ordinal ranking of the candidate systems in order of preference were accomplished. An exploration of the design space was made to identify the parameter values which would yield the maximum theoretic value of the criteria for this design space and the results compared with the highest ranked candidate system. During the design of the Service Stand, no unusual emphasis on human factors was made with the design engineers, but the results indicate strong acceptance of human factors and human resource limitations when the problem definition is adequately structured for the designers. GRA

N79-32841# Trinity Univ., San Antonio, Tex. Dept. of Engineering Science.
A THEORETICAL INVESTIGATION OF POWER AND CONTROL CONFIGURATIONS FOR A HIGH G-ONSET CENTRIFUGE DRIVE SYSTEM Final Technical Report, Jun. 1978 - May 1979
T. J. Jones 22 May 1979 11 p
(Grant AF-AFOSR-3622-78; AF Proj. 2313)
(AD-A070912; AFOSR-79-0820TR) Avail: NTIS HC A02/MF A01 CSCL 14/2

An investigation of both the power drive system and the control system for high G-onset rates in a human centrifuge was carried out. Although the analysis was general, much of it specifically considered the A/F 37V-1 centrifuge at Brooks AFB. It is shown that an electric drive system, and gondola passenger control of G forces results in a system capable of simulating aerial combat maneuvers. The drive system consists of an SCR control of the A.C. line voltage applied to D.C. motors. The control system provides for cockpit stick control of the centrifuge's angular velocity and angular acceleration. GRA

N79-32842# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
COMBINED DISCRETE NETWORK: CONTINUOUS CONTROL MODELING OF MAN-MACHINE SYSTEMS Ph.D. Thesis
Deborah J. Seifert Mar. 1979 204 p refs
(AF Proj. 2313)
(AD-A071574; AMRL-TR-79-34) Avail: NTIS HC A10/MF A01 CSCL 05/8

The role of the human operator in control systems is evolving towards that of a supervisor who plans sequences, and monitors and away from strictly tracking. New modeling approaches and techniques are required to realistically represent and examine these new system configurations and resulting performance issues. This dissertation study proposed an alternate modeling approach comprised of discrete network models in combination with elements of an open-loop optimal control model formulation. The feasibility of employing this combined modeling approach was demonstrated through its application to the DAIS (Digital Avionics Information System) system in which pilot duties involve information retrieval and cognitive processing tasks in addition to flight control. GRA

N79-32843# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
TENTATIVE EVALUATION OF ANNOYANCE CAUSED BY NOISE FROM GUNFIRE
G. F. Smoorenburg 1978 52 p refs In DUTCH; ENGLISH summary
(IZF-1978-21; TDCK-71624) Avail: NTIS HC A04/MF A01

Based on an extensive survey of the pertinent literature a method was developed to determine the annoyance that may be expected from noise due to gunfire. This method may be applied to noise from both small and heavy firearms, and also to sonic booms. The annoyance to be expected is derived from the difference between the rating sound level and the noise criterion. The rating sound level is determined by the number of shots per day and the sound levels of the respective shots measured with the A-weighting and the impulse characteristic. Application of the impulse characteristic is based on properties of the hearing organ in the perception of short sounds. If the sound impulses contain a lot of low-frequency energy (heavy firearms, explosions, or sonic booms) the peak level of the sound

impulse must be measured with linear frequency weighing. The rating sound level is determined by the lin, peak-level if this level exceeds the A, imp-level by more than 10 dB.

Author (ESA)

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N79-32844 Polytechnic Inst. of New York.
THE AUTOMATIC REVISION OF STORAGE STRUCTURES Ph.D. Thesis
Frances G. Gustavson 1979 200 p
Avail: Univ. Microfilms Order No. 7920782

A virtual file handler is presented and how it may be used directly as a file system by an application program, or may be used as the basis of a data management system which may in turn be used as the basis for a data base management system is shown. A data management system developed using this virtual file handler would permit users to create, access, modify and store their collections of data items, as in existing systems. In addition, a data management system developed using this virtual file handler would permit the automatic or semiautomatic revision of storage structures with all interrelationships preserved. This revision entails a revision of the storage structure itself, a change from one structure to an inherently different one. Dissert. Abstr.

N79-32845 Massachusetts Univ., Amherst.
UPDATE SYNCHRONIZATION IN MULTIACCESS DATABASE SYSTEMS Ph.D. Thesis
Milan Milenkovic 1979 149 p
Avail: Univ. Microfilms Order No. 7920872

A unified approach to concurrency control in both centralized and distributed database systems is presented. The use of the same conceptual tools to solve both problems results in reduced storage and computational overhead, increased overall efficiency, and simplicity of comprehension and implementation when applied to distributed database systems. A simple and efficient mechanism for synchronization of concurrent updates in the database systems with centralized concurrency control is proposed. Two different algorithms, based on deadlock prevention, are devised to meet the requirements of different types of transactions. Two decentralized solutions to the specialized problems of relocation and accessing of shared and migrating modules in distributed processing systems are also presented. It is demonstrated that both solutions guarantee efficient accessing of any module in finite time despite its migrations among the nodes of the system. Dissert. Abstr.

N79-32846 Polytechnic Inst. of New York, Brooklyn.
ANALYSIS AND DESIGN OF PIPELINED PROCESSORS Ph.D. Thesis
Jamshed Hormazdyar Mirza 1979 185 p
Avail: Univ. Microfilms Order No. 7920792

Various pipelined processors were studied. A taxonomy based on pipe structure, pipe configurability, and job characteristics is proposed for comparing pipelined architectures. A performance factor was selected to reflect the pipelined characteristics of a system. A Markov chain model was formulated and used to evaluate the average job initiation rate under conditions of logical dependencies among jobs, collisions at shared segments and reconfiguration overheads. A systematic design process for linear pipes is presented in which registers are either significant or nonsignificant. The dependencies upon nonsignificant registers were avoided by replicating the registers over a number of segments and allowing the corresponding values to travel from segment to segment along with the jobs. An approach for the design of planar and multifunctional pipes is suggested and non-serial dynamic programming is used to obtain the optimal design. Dissert. Abstr.

N79-32847 Texas A&M Univ., College Station.
AN EXPERIMENTAL NATURAL-LANGUAGE PROCESSOR FOR GENERATING DATA TYPE SPECIFICATIONS Ph.D. Thesis
James Ray Comer 1979 158 p
Avail: Univ. Microfilms Order No. 7919057

The utility of specification languages is investigated. A formal algebraic notation suitable for describing data specifications is presented, and an automatic programming system, utilizing natural language inputs, is developed. The system serves to demonstrate the feasibility of generating specifications using English as a discourse medium. Dissert. Abstr.

N79-32848 New York Univ., N. Y.
AUTOMATIC STORAGE OPTIMIZATION Ph.D. Thesis
Janet Fabri 1979 372 p
Avail: Univ. Microfilms Order No. 7918949

A storage optimizing compiler that performs automatic data overlay determination and storage optimizing code transformation is discussed and a structure for such a compiler is proposed. The automatic data overlay problem is formulated as an extended coloring problem on the program conflict graph. An exact exponential algorithm for overlay determination using the graph is given. A canonical renaming transformation that always reduces the conflict graph's maximum clique size to the program's maximum live set size is presented, together with a proof of this property. A procedure that determines what program units should be split, copied or moved in order to eliminate a particular conflict is also presented. An empirical investigation of the applicability of these techniques was conducted, using an implementation of the above algorithms called SOCRATES.

Dissert. Abstr.

N79-32849 California Univ., Santa Barbara.
COMPUTER PERFORMANCE MEASUREMENT TOOLS AND TECHNIQUES Ph.D. Thesis
Donald Neal Dumont 1978 217 p
Avail: Univ. Microfilms Order No. 7921039

A software computer performance measurement system which would provide maximum flexibility in the measurement process was designed and partially implemented. The system is proposed as a research tool to produce the information necessary to develop an effective, integrated performance measurement system. It is shown that facilities are available today which would allow the development of a general purpose, flexible, hybrid monitoring system. It is further shown that small architectural changes could enhance such a system. It is concluded that systems can be developed with performance monitors included as integral components of the design of both the hardware and software systems. Dissert. Abstr.

N79-32850 Arizona State Univ., Tempe.
A SIMULATION TECHNIQUE FOR ENHANCING CODASYL DATABASE IMPLEMENTATIONS Ph.D. Thesis
Alan Bier 1979 349 p
Avail: Univ. Microfilms Order No. 7919167

The structural concepts and organization of CODASYL DBTG database systems are presented. The objectives, functions and features of these systems are profiled, and the database design process is described in terms of its logical, physical and implementation aspects. The access mechanisms built into the CODASYL database systems are examined, and it is seen that the implementation of a secondary index can serve to improve performance. Various file organizations which are candidates for organizing the secondary index are evaluated with respect to storage requirements and functional efficiency. File organization performance is defined and contributing factors are identified. The selection of a suitable storage device is seen to play a large role in determining performance. A system level database design and implementation model which is specifically tailored towards CODASYL DBTG database systems is developed.
Dissert. Abstr.

N79-32851 Memphis State Univ., Tenn.
FLEXIBLE DISK FILE STRUCTURES FOR MICROCOMPUTER SYSTEMS Ph.D. Thesis
John Edward Thompson, Jr. 1979 188 p
Avail: Univ. Microfilms Order No. 7919877

The application was investigated of data file structure theory to a flexible disk data storage system which is characterized by many queries and insertions into the file, few deletions from the file, and relatively infrequent alphabetical listings. Descriptions of the basic file organizations - sequential, lists, random, trees - are made and algorithms for searching, insertion of data, deletion of data, and alphabetical, or linear, listing of these types of file structures are discussed. Several methods for reducing the amount of wasted space on the disks by packing of data into the files without seriously disturbing the overall data structure are discussed, and modifications in the algorithms for searching, insertions, deletions, and linear listings, are made to accommodate these changes. Included in this discussion is the storage of multiple items in a single record or node, the use of data extension files which are pointed to from a keyword file, and the handling of variable length records. Algorithms for the insertion and deletion of information from the data extension files are also given.
Dissert. Abstr.

N79-32852*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH SPEED, GLITCH-FREE DIGITAL TO ANALOG CONVERTER Patent Application
Paul J. Grunberger, inventor (to NASA) (APL) Filed 3 Jul. 1979 14 p Sponsored by NASA
(NASA-Case-GSC-12319-1; US-Patent-Appl-SN-054538) Avail: NTIS HC A02/MF A01 CSCL 09B

A digital to analog converter that eliminates glitches in the analog output waveform by using binary to unitary code conversion prior to summing is presented. The unsaturated emitter coupled logic that forms the converter allows a very high data conversion rate as well as improved synchronization among circuit elements.
NASA

N79-32853# Massachusetts Inst. of Tech., Cambridge. Architecture Machine Group.
SPATIAL DATA MANAGEMENT SYSTEM Final Technical Report, 1 Oct. 1976 - 30 Sep. 1978
Richard A. Bolt 31 Dec. 1978 63 p
(Contract MDA903-77-C-0037; ARPA Order 3300)
(AD-A070243) Avail: NTIS HC A04/MF A01 CSCL 09/2

The Architecture Machine Group has been developing an experimental information system which exploits the user's sense of spatiality to organize and access data. Conceptual roots lie in the observation that one can readily locate and retrieve some book from one's bookshelf, or the appointment calendar from one's desktop, on the basis of where it is, or where one put it, in a well-learned, familiar space. A prototype system has been developed that uses wall-sized, full color digital television with synchronized stereo sound to create a virtual spatial world, 'Dataland', over which the user helicopters via joystick control. Items of interest seen through a graphics 'window' can be zoomed in upon and interactively perused. Data types include maps, text, book-like items, letters, photographs, slides moves, sound and television. Results thus far suggest that the user quickly learns in the order of minutes to navigate about such a space, and readily adopts a spatial way of regarding and discussing data. The approach of managing data spatially is offered not as an alternative in competition with managing data on a symbolic or name basis, but as a complement thereto. This manner of dealing with data should have special appeal for that class of user for whom directness and immediacy are essential qualities for interaction.
Author (GRA)

N79-32854# Wisconsin Univ. - Madison. Mathematics Research Center.
CHEOPS: A PROJECT FOR EVALUATING ANSI/SPARC ARCHITECTURE
A. Klug May 1979 40 p refs
(Contract DAAG29-75-C-0024)
(AD-A070218; MRC-TSR-1959) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper describes a project for evaluating the ANSI/SPARC framework. This framework proposes a three schema-level architecture in which the outermost level supports different user views through different data models the central level, provides an unbiased description of the overall database, and the innermost level supports efficiency-oriented concepts. The three levels are connected by mappings. This architecture is currently being studied by a study group of the American National Standards Institute as a possible model for database standardization. This project will test the feasibility and appropriateness of the architecture by actually building a database system conforming to the architecture. The system will test a number of potential problem areas and possible solutions. This paper discussed these potential problems and some of the project's approaches to them. GRA

N79-32855# Illinois Univ. at Urbana-Champaign. Coordinated Science Lab.
THE EFFECT OF PROGRAM BEHAVIOR UPON INTERLEAVED MEMORY BANDWIDTH IN A MULTIPROCESSOR ENVIRONMENT
B. Ramakrishna Rau Sep. 1978 59 p refs
(Contract DAAB07-72-C-0259)
(AD-A070115; R-826; UILU-ENG-78-2219) Avail: NTIS HC A04/MF A01 CSCL 09/2

An analysis is performed of the memory bandwidth that results in a system consisting of multiple processors and a shared, interleaved memory. Special emphasis is placed on studying and modeling the memory referencing behavior of the programs that execute on the processor and in ascertaining the effect that this behavior has on the memory bandwidth. Some commonly used models of program behavior are shown to be unrealistic and, instead, a new, more sophisticated model is proposed and validated by means of measurements on four trace tapes. Based on this model of program behavior, a simple structural model of the system is analyzed. This is effected by extending a technique previously developed for use with a simpler model of program behavior and by advancing a new technique based on the diffusion approximation and probability generating functional methods. The latter analysis is shown, via simulations, to be very accurate. Finally, it is demonstrated that program behavior, in this context, may be captured by a simple, two-parameter model. GRA

N79-32856# Wisconsin Univ. - Madison. Mathematics Research Center.
QUERY EXECUTION IN DIRECT
David J. DeWitt Mar. 1979 18 p refs
(Contract DAAG29-75-C-0024; Grants NSF MCS-78-01721; NSF MCS-77-08968)
(AD-A070195; MRC-TSR-1935) Avail: NTIS HC A02/MF A01 CSCL 09/2

In this paper query organization, execution, and optimization in the database machine DIRECT are discussed. We demonstrate that the use of a monitor for each relation referenced by a query along with the use of the NEXT PAGE construct permits the DIRECT back-end controller to assign a query to any number of processors for execution. Furthermore, these constructs also permit the controller to balance the load in the back-end by dynamically adjusting how many processors are assigned to each executing query. We also identify the problem of relation fragmentation which occurs when a query is executed by several processors in parallel and develop a technique for estimating the optimal number of processors to compress a relation so

that the execution time of the entire query is minimized. These results appear to be applicable to all database machines which employ parallel processing techniques to enhance query execution. GRA

N79-32857# Naval Ocean Systems Center, San Diego, Calif.
COMPUTER DISPLAY SET AN/UYQ-21 TECHEVAL TEST. SYSTEM MEETS ALL SPECIFICATIONS AND IS JUDGED TO BE SUITABLE FOR OPEVAL Final Report, 3 May 1978 - 12 Jan. 1979
C. C. Coghill, III, J. D. Baxter, and D. C. Lutz 9 Mar. 1979 49 p refs
(AD-A070260; NOSC/TR-396) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report documents the technical evaluation (TECHEVAL) testing of Computer Display Set AN/UYQ-21(V) at NOSC and aboard USS FANNING (FF 1076). Land based TECHEVAL testing was conducted at NOSC 3 May-4 Oct 1978. Shipboard TECHEVAL testing was conducted aboard the FANNING 23 October 1978-12 January 1979. Formal TECHEVAL testing was completed 12 January 1979. The system meets design and technical performance specifications, is functioning in a technically acceptable manner, and is suitable for OPEVAL. Installation aboard the OPEVAL ship is complete, with the equipment functioning to specification. GRA

N79-32858# Electronics Research Lab., Adelaide (Australia).
A MICROPROCESSOR BASED IMAGE STORAGE AND ANALYSIS FACILITY FOR INFRARED SIGNATURE MEASUREMENT AND IMAGE PROCESSING
G. V. Poropat Nov. 1978 32 p refs
(AD-A070288; ERL-0050-TM) Avail: NTIS HC A03/MF A01 CSCL 17/5

The design and operation of a microprocessor based data acquisition system is described. The system is capable of digitizing and storing a frame of pictorial information from an AGA Thermovision and provides facilities for the analysis of the stored information. Transfer of the stored information to the IBM 370/168 can be achieved at high speed and sophisticated processing applied to the stored data. The use of a microprocessor as the controlling unit has allowed the implementation of some analysis and processing facilities at the experimental site. GRA

N79-32859# Massachusetts Inst. of Tech., Cambridge. Center for Information Systems Research.
DECOMPOSITION OF WEIGHTED GRAPHS USING THE INTERCHANGE PARTITIONING TECHNIQUE
Sid L. Huff Mar. 1979 90 p refs
(Grant N00039-78-G-0160)
(AD-A069549; CSIR-P010-7903-08; CISR-TR-8) Avail: NTIS HC A05/MF A01 CSCL 09/2

The objective of this study is to develop a systematic approach to the architectural design of complex software systems. This contract builds on earlier work, in which a graph modelling and decomposition methodology was used to operate upon a set of functional requirements and their interrelationships to generate an architectural design. This report introduces a new algorithm for partitioning weighted graphs in a hierarchical manner. The algorithm, termed the interchange partitioning technique, has been developed to aid in the analysis of requirements graphs generated through the Systematic Design Methodology. However, it is sufficiently general to be of use in many other types of graph analysis problems as well. As well as describing and giving examples of the basic interchange technique, this report also includes a discussion of certain simplifications that may be made to the algorithm in order to significantly improve its efficiency without hampering its effectiveness. Also, a master control algorithm is presented for guiding the execution of a complete graph decomposition using the interchange partitioning technique. GRA

N79-32860# National Physical Lab., Teddington (England). Div. of Electrical Science.
SOME FURTHER DEVELOPMENTS OF THE ITERATIVE DIGITAL CELLULAR MULTIPLIER
J. R. Stockton and R. B. D. Knight Mar. 1979 51 p refs
(NPL-DES-51) Avail: NTIS HC A04/MF A01

Various extensions of the type-1 multiplier of Chung and Bedrosian are presented. They use the same type of linear array of Read-Only Memories (ROM) loaded with different data and can do both simple and cumulative multiplication. Certain other operations may also be performed. The meanings of the ROM outputs are given. An alternative method of implementing the algorithms is proposed, using only one ROM, which operates in a bit-serial fashion on data stored in a Read-Write Memory. Related systems for converting binary quantities to BCD or to mixeases, and for division, are also discussed. Author (ESA)

N79-32861# National Aerospace Lab., Amsterdam (Netherlands). Div. of Scientific Services.
MICROPROCESSOR AS AN INTELLIGENT INTERFACE BETWEEN FLIGHT DATA ACQUISITION EQUIPMENT AND A MINICOMPUTER
J. Kruisbrink 15 Mar. 1978 16 p Presented at IERE Conf. on Microprocessors in Automation and Commun., Canterbury, England, 18-22 Sep. 1978
(NLR-MP-78007-U) Avail: NTIS HC A02/MF A01

A microprocessor (M6800) based interface was constructed for a small ground-based mobile test station. This station allows preflight inspection of aircraft-installed data acquisition equipment and postflight rough analysis of acquired flight data. The interface can link various kinds of data acquisition equipment to a minicomputer. It also selects and buffers data words from the frame organized data stream, received from the particular data acquisition equipment connected. Under control of the interface, selected data words are taken from the buffer and sent to the minicomputer. The minicomputer processes the data words to yield a plot. The main objective of the interface is to decrease the CPU-load on the minicomputer. The functional requirements for and the design and development of the interface are examined. The performance of the microprocessor program cited that can handle a continuous data stream with a word rate as high as 10 kHz, is discussed. Author (ESA)

N79-32862# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
THE NPL IMPLEMENTATION OF LEVEL 2 OF THE X25 INTERFACE
B. E. Aldous May 1979 29 p ref
(NPL-DNACS-18/79) Avail: NTIS HC A03/MF A01

The implementation of level 2 of the CCITT recommendation, X25, for the interface between data terminal equipment and data circuit-terminating equipment operating in the packet mode on public data networks is described. This implementation, together with the remainder of the X25 recommendation, is for inclusion in a multi-microprocessor interface computer, built at the NPL, for conversion from the X25 interface to that employed in the European Informatics Network (EIN). Subjects covered a general overview of the complete interface computer, the EIN Matching Unit, a brief functional description of the level 2 implementation, and a detailed description of the software procedures employed. Author (ESA)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N79-32863 Wisconsin Univ. - Madison.
DEFINITION AND USE OF ATTRIBUTE REEVALUATION IN ATTRIBUTED GRAMMARS Ph.D. Thesis
Stephen Karl Skedzeleski 1978 144 p
Avail: Univ. Microfilms Order No. 7916593

Attributed grammars can be used to specify both the syntax and the semantics of programming languages, and provide an implementation for compilers. Extensions to attributed grammars are discussed as is a generalization of attribute evaluation that allow code optimization techniques to be efficiently implemented and easily specified. A formal definition of the extended attributed grammars, called time-varying attributed grammars, is given. Time-varying attributed grammars provide a high-level, nonprocedural specification of iterative algorithms. Evaluators for time-varying attributed grammars are described and potential problems

that can result from their use are discussed. Examples of common code optimization techniques are given using time-varying attributed grammars. Techniques that reduce the overhead of evaluation, and also simplify the specification of attributed grammars are suggested. Dissert. Abstr.

N79-32864 George Washington Univ., Washington, D. C.
A PROGRAM VERIFIER AND PROOF OF THE CORRECTNESS OF A FLIGHT DIRECTOR PROGRAM Ph.D. Thesis
Frank Jen-Shiung Lee 1979 227 p refs
Avail: Univ. Microfilms Order No. 7919552

Techniques for proving the correctness of Litton C-4000 assembly language programs are devised. A program verification system, based on the conventional inductive assertion method, is developed to generate verification conditions from an asserted program and to prove that these conditions are true. The design philosophy, algorithm, and structure of the system are described in detail. A proof of the correctness of a flight director program written for the Litton C-4000 airborne computer is carried out with the program verification system. It includes overflow analysis, non-self-modification analysis, fixed-point scaling consistency checking, and proofs of partial correctness and termination. The functional and logical natures of the flight director program are analyzed, and strategies used in the proof process are presented. Dissert. Abstr.

N79-32865 Texas A&M Univ., College Station.
A STATISTICAL METHODOLOGY FOR CONSTRUCTING SYNTHETIC TEST WORKLOADS Ph.D. Thesis
Wayne Thomas Graybeal 1979 174 p
Avail: Univ. Microfilms Order No. 7919072

Computer performance measurement and evaluation (CPME) studies are conducted for the purpose of sizing and selecting a new system (selection studies); during the design phase of either a new system or a hardware/software modification to an existing system to assess the impact of the new system/modification (performance projection studies); or to assess and improve the level of performance of an existing system (performance monitoring studies). Nearly all performance measures used are related to the workload which emulates the actual workload, yet executes in less time and does not compromise the adequacy of the measurements. Such a workload is called a drive or test workload. A statistical methodology is proposed to aid in the construction of a test workload. Dissert. Abstr.

N79-32866 Arizona Univ., Tucson.
THE DESIGN AND IMPLEMENTATION OF A GOAL-DIRECTED PROGRAMMING LANGUAGE Ph.D. Thesis
John Timothy Korb 1979 107 p
Avail: Univ. Microfilms Order No. 7920597

Linguistic facilities that form the basis of the goal-directed facilities for the Icon programming language are described. In Icon, goal-directed programming is based on generators which form an integral part of the language and can be used anywhere a value is required. If the value produced by a generator does not yield a successful result, the generator is automatically activated for an alternate value. A string scanning facility using generators is described. The scanning operations are applied directly to the global subject. Examples illustrate how generators can be used in constructs not usually considered related to goal-directed programming. A method for implementing generators, which has been successfully used in Icon, is described. An advantage of the implementation technique is that little overhead is incurred by expressions that do not use the goal-directed facilities. Dissert. Abstr.

N79-32867 Pennsylvania Univ., Philadelphia.
COOPERATIVE RESPONSES FROM A PORTABLE NATURAL LANGUAGE DATA BASE QUERY SYSTEM Ph.D. Thesis
Samuel Jerrold Kaplan 1979 295 p
Avail: Univ. Microfilms Order No. 7919473

A limited theory of cooperative behavior in question answering is presented and applied in a query system that is capable of various types of direct and indirect responses. Problems in the representation of the knowledge required to produce such responses are explored. The implementation of the system illustrates that a data base (DB), a DB scheme, and a suitably encoded lexicon are sufficient sources of domain specific knowledge to provide appropriate responses to a habitable class of simple natural language questions. As a result, the system achieves a high degree of portability to new DB domains. Transcripts of the program's behavior on two radically different DBs are presented and analyzed. In addition, issues in the production of useful paraphrases, effective error handling, transparency of DB update, and efficient path finding in DB schemas are discussed. Dissert. Abstr.

N79-32868 New York Univ., N. Y.
GROUPS WITH SOLVABLE WORD PROBLEMS Ph.D. Thesis
Christine Semeniuk 1979 102 p
Avail: Univ. Microfilms Order No. 7918995

Two aspects of the word problem for groups are considered: (1) similarities between derivations from the relations of a group and proofs from a set of axioms in logic; and (2) the computational difficulty of word problems and the problem of constructing groups with solvable word problems of some preassigned degree of difficulty. With the presentation of a group in terms of generators and relations, two words on the generators are defined to be equal if and only if one is transformed into the other in a finite number of steps using the relations of the group. Defining equality in a group as derivability from a set of axioms suggests formulating the word problem for a group as the derivability problem for a formal system. The system chosen is equational logic. Dissert. Abstr.

N79-32869 Texas A&M Univ., College Station.
A NONLINEAR MULTIPROCESSOR SCHEDULING PROBLEM Ph.D. Thesis
Camille Cook Price 1979 117 p
Avail: Univ. Microfilms Order No. 7919099

The problem of assigning modules of a computer program among processors in a distributed computer network having functionally similar nodes is addressed. The assignment is made to take advantage of particular efficiencies of some processors for certain modules while minimizing the costs of communication between modules that are assigned to different processors. The problem is formulated as a zero one nonlinear programming problem. A graph model is developed which provides a state space representation of the problem, and a shortest path labeling algorithm is given which produces an assignment. A heuristic procedure is described which is a nonbacktracking branch and bound technique, using a local neighborhood search at each stage. The algorithms are implemented in computer programs and computational results are reported. Dissert. Abstr.

N79-32870 Massachusetts Univ., Amherst.
SEGMENTATION OF STATIC AND DYNAMIC SCENES Ph.D. Thesis
John Martin Prager 1979 369 p
Avail: Univ. Microfilms Order No. 7920885

Neurophysiological and psychophysical data on how animals and humans segment visual images is used to gain insight for scene analysis. Segmentation of dynamic scenes, as in nature, is in many ways easier than that of static scenes since there is information about object boundaries that results purely from the motion in the scene. The concept of optic flow is extended to form a low level representation of the observed motion. A program called MATCH, developed to generate the flow field, is applied to a sequence of frames of real data. Predictive mechanisms show that the computational effort required to analyze the third and subsequent frames is greatly reduced. Dissert. Abstr.

N79-32871 Wisconsin Univ. - Madison.
LOCALLY LEAST-COST ERROR CORRECTORS FOR CONTEXT-FREE AND CONTEXT-SENSITIVE PARSERS Ph.D. Thesis
Bernard Andre Dion 1978 167 p
Avail: Univ. Microfilms Order No. 7915087

A model of error correction is presented. Upon detection of a syntax error, a locally least-cost corrector operated by deleting phi or more input symbols, and inserting a terminal string guarantees that the first nondeleted symbol will be accepted by the parser. The total correction cost, as defined by a table of deletion and insertion costs, is minimized. Previous work with the LL(1) parsing technique is summarized and a locally least-cost

error corrector for LR(1)-based parsers is developed. Correctness as well as time and space complexity are discussed. In particular, linearity is established in the case of a bounded depth parse stack. Implementation results are presented. Attributed grammars can be used to specify the context-sensitive syntax of programming language. A formal presentation of Attribute-Free LL(1) parsing is given and a locally least-cost error corrector for AF-LL(1) parsers is developed for the case in which the attributes that control context-sensitive correctness have finite domains. The algorithm is shown to have the same properties as its LL(1) and LR(1) counterparts. Dissert. Abstr.

N79-32872 Pennsylvania Univ., Philadelphia.
DYNAMIC MULTILEVEL SIMULATION Ph.D. Thesis
James Eugene Coffman 1979 158 p
Avail: Univ. Microfilms Order No. 7919441

The use of dynamic multilevel simulation, especially in the domain of digital system simulation is investigated. A dynamic multilevel simulation system simulates a system (object system) at many different levels of detail. The simulator is used to debug the software which drive the processors in processor based digital systems. The advantage over conventional instruction set simulators is it allows the inclusion of hardware which affects the processor in ways not expressible solely in terms of instruction execution. Additionally, it is used in a limited way to debug hardware designs. A test implementation of this methodology and its performance are discussed. Dissert. Abstr.

N79-32873 Carnegie-Mellon Univ., Pittsburgh, Pa.
ON THE EFFICIENT IMPLEMENTATION OF PRODUCTION SYSTEMS Ph.D. Thesis
Charles Lanny Forgy 1979 187 p
Avail: Univ. Microfilms Order No. 7919143

The algorithms used by a production system interpreter and the hardware on which the algorithms are executed are discussed. A detailed description is presented of a method for evaluating a set of patterns which (1) notes the similarities in the patterns so that it can avoid performing the same test more than once; (2) takes advantage of the fact that both the set of patterns and the set of objects change slowly by saving information from one evaluation to the next; and (3) allows a high degree of parallel activity during the evaluation. This method involves the use of a compiler which translates the patterns into a program for a virtual pattern-matching machine. It is shown that, although the instructions for this machine appear quite different from the instructions for a conventional processor, they can be interpreted efficiently on a conventional microprogrammed computer. If a microprogrammed computer were augmented with some inexpensive hardware described, it would be able to interpret the virtual machine instructions as fast as it interprets conventional instructions. Without the special hardware, the computer would interpret the virtual machine instructions about three times more slowly. Dissert. Abstr.

N79-32874 Maryland Univ., College Park.
CELLULAR GRAPH AUTOMATA Ph.D. Thesis
Angela Yuen Wu 1978 208 p
Avail: Univ. Microfilms Order No. 7920739

It is shown that a cellular d-graph automaton can measure various properties of its underlying graph, including the radius as measured from a given node, and the number of nodes, in time proportional to the diameter of the given graph. Slower algorithms for measuring the true radius (the least radius from any node), and for finding bridges and cut nodes, are also discussed. Cellular d-graph acceptors that detect graph or subgraph isomorphism in time proportional to the diameter of the given graph are presented. In some of the algorithms, special assumptions are made about the homogeneity of the graph; these assumptions hold for many important classes of graphs, including trees and arrays. Diameter time algorithms are also presented for recognition of various basic types of graphs, including cycles, trees, cliques, rectangular arrays, bipartite and complete bipartite graphs, by deterministic cellular d-graph acceptors. Dissert. Abstr.

N79-32875*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SOFTWARE DESIGN AND DOCUMENTATION LANGUAGE, REVISION 1
Henry Kleine 1 Aug. 1979 88 p refs Revision
(Contract NAS7-100)
(NASA-CR-162291; JPL-Pub-77-24-Rev-1) Avail: NTIS HC A05/MF A01 CSCL 09B

The Software Design and Documentation Language (SDDL) developed to provide an effective communications medium to support the design and documentation of complex software applications is described. Features of the system include: (1) a processor which can convert design specifications into an intelligible, informative machine-reproducible document; (2) a design and documentation language with forms and syntax that are simple, unrestrictive, and communicative; and (3) methodology for effective use of the language and processor. The SDDL processor is written in the SIMSCRIPT II programming language and is implemented on the UNIVAC 1108, the IBM 360/370, and Control Data machines. J.M.S.

N79-32876*# Michigan Univ., Ann Arbor. Systems Engineering Lab.
PHASED MODELS FOR EVALUATING THE PERFORMABILITY OF COMPUTING SYSTEMS
L. T. Wu and J. F. Meyer Jul. 1979 26 p refs
(Grant NsG-1306)
(NASA-CR-162317; UMICH-014524-8-T; UMICHSEL-135)
Avail: NTIS HC A03/MF A01 CSCL 09B

A phase-by-phase modelling technique is introduced to evaluate a fault tolerant system's ability to execute different sets of computational tasks during different phases of the control process. Intraphase processes are allowed to differ from phase to phase. The probabilities of interphase state transitions are specified by interphase transition matrices. Based on constraints imposed on the intraphase and interphase transition probabilities, various iterative solution methods are developed for calculating system performability. K.L.

N79-32877*# Michigan Univ., Ann Arbor. Systems Engineering Lab.
METAPHOR (VERSION 1): USERS GUIDE
D. G. Furchtgott Jul. 1979 142 p refs
(Grant NsG-1306)
(NASA-CR-162322; Rept-014524-9-T; SEL-136) Avail: NTIS HC A07/MF A01 CSCL 09B

General information concerning METAPHOR, an interactive software package to facilitate performability modeling and evaluation, is presented. Example systems are studied and their performabilities are calculated. Each available METAPHOR command and array generator is described. Complete METAPHOR sessions are included. K.L.

N79-32878# Kansas Univ., Lawrence. Dept. of Computer Science.
IMPLEMENTATION AND EVALUATION OF INTERVAL ARITHMETIC SOFTWARE. REPORT 3: THE HONEYWELL G635 SYSTEM
James Q. Arnold and Frank P. Ford Apr. 1979 93 p refs
(Contracts DACA39-76-M-0248; DACA39-77-M-0107)
(AD-A070374; WES-TR-0-79-1; Rept-3) Avail: NTIS HC A05/MF A01 CSCL 09/2

This is Report 3 of a series entitled 'Implementation and Evaluation of Interval Arithmetic Software.' The series concerns implementation and evaluation of an interval arithmetic software package on six different computer systems. The most significant fact that has emerged from this project is that interval arithmetic has limited value as a tool for analyzing real algorithms. The limitation is specifically dependency. The magnitude and complexity of many of the problems being solved at the Waterways Experiment Station make interval analysis of the solution algorithms and sensitivity analysis of the data extremely difficult to accomplish with very high reliability using the current package. The effort to employ interval arithmetic might better be directed toward development of new algorithms based on interval concepts than toward analysis of real algorithms currently in use. Alternatively, redefining the arithmetic operations and interval representation might convert interval into a more practical tool for analysis of the real algorithms. GRA

N79-32879# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.

DISTRIBUTED COMPUTER SYSTEMS: STRUCTURE AND SEMANTICS
Liba Svobodova, Barbara Liskov, and David Clark Mar. 1979 65 p refs
(Contract N00014-75-C-0661)
(AD-A070286; MIT/LCS/TR-215) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report describes an ongoing project in the area of design of distributed systems. The goal is to develop an effective programming system that will support well-structured design, implementation, maintenance and control of distributed processing applications. This programming system combines a powerful high level language and operating system features, and addresses the underlying system problems that affect the reliability and security perceived on the application level. The report presents a conceptual model of distributed computation, and, in the context of this model, discusses our approaches to inter-node communication and cooperation, reliability, and protection. One of the basic goals of our project is to allow the application programmer to work with application-oriented entities. Thus, inter-node messages, error handling and protection constraints will all be expressible in application oriented terms. The report concludes with some examples of the language constructs and an outline of the future research under this project. GRA

N79-32880# Dayton Univ., Ohio.
SOFTWARE RELIABILITY DETERMINATION AND PREDICTION Final Report, May 1977 - Jun. 1978
L. S. Gephart, C. M. Greenwald, M. M. Hoffman, and D. H. Osterfeld Jun. 1978 233 p refs
(Contract F33615-77-C-3072; AF Proj. 2403)
(AD-A069976; AFFDL-TR-78-77) Avail: NTIS HC A11/MF A01 CSCL 09/2

This study gives a comprehensive review of software reliability determination and prediction techniques and models. Each technique and model is discussed and evaluated as to its applicability to the software in a real-time, automatic digital flight control system. A total of seven techniques, nine empirical models, and fifteen analytical models are studied. Whenever possible the techniques and models have been applied to real software error data. The report is divided into three sections. Section I discusses software reliability in general and then focuses on each of the techniques and models individually. It provides a preliminary evaluation of each model and partitions out four of the most promising approaches, which are then analyzed more thorougly. Section II addresses the absolute necessity of gathering well documented software error data as well as the problems associated with its collection. It also provides references for a number of software error data sets. Section III includes conclusions relative to the most attractive models, recommendations for the collection of software error data, and suggestions for future study. GRA

N79-32881# Naval Intelligence Processing System Support Activity, Alexandria, Va.
STRUCTURED PROGRAMMING IN A DATABASE ENVIRONMENT
L. E. Towner 24 May 1979 19 p
(AD-A070270) Avail: NTIS HC A02/MF A01 CSCL 09/2

Structured programming has been actively endorsed by proponents of improved data processing management techniques for several years. Many examples of reduced costs and improved project control have been cited. Unfortunately, applications of these techniques have failed to meet the expectation in many cases. The advent of the database management system (DBMS) as a major support tool in the data processing picture has also resulted in mixed results, often falling far short of the pre-installation build-up. Frequently this lack of DBMS achievement can be traced to inadequate control of the applications projects which will utilize the DBMS. This paper describes the use of structured techniques, both analysis and programming, in overcoming the problems of database applications software support. Structured techniques are particularly applicable to the database environment because of the centralizing of procedural and logical programming functions around the DBMS software. GRA

N79-32882# Stanford Univ., Calif. Dept. of Computer Science.
EXTRAPOLATION OF ASYMPTOTIC EXPANSIONS BY A MODIFIED AITKEN DELTA SUP 2 FORMULA
P. Bjorstad, G. Dahlquist, and E. Grosse Mar. 1979 53 p refs
(Contract EY-76-S-0326-030)
(SU-326-P-30-61; SU-STAN-CS-79-719) Avail: NTIS HC A04/MF A01

A modified Aitken formula permits iterated extrapolations for efficient estimation of s/sub infinity/ from s/sub n/ when an asymptotic expansion s/sub n/ = s/sub infinity/ + n to the -k power (c sub 0 + c sub 1 n to the -1 power + c sub 2 n to the -2 power +...) holds for some (unknown) coefficients c/sub j/. Truncation and irregular errors are studied, and the method is compared with other forms of extrapolation. DOE

N79-32883# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
PROCOPES (CONVERSATIONAL PROGRAM FOR SIGNAL PROCESSING): EVOLUTION TOWARD AN INTERPRETATIVE COMMAND LANGUAGE Ph.D. Thesis - Paris-Sud Univ.
Jean-Paul Boisseau 1978 150 p refs In FRENCH; ENGLISH summary Translation is in process as ESA-TT-581
(ONERA-NT-1978-8) Avail: NTIS HC A07/MF A01

Results of work with a computer piloted signal processing system are reported. The complexity of the analysis instrumentation, the diversity of processings requested by the users, and the orientation toward self-service showed the necessity of implementing an evolutive, conversational system with a simple command language which, at the same time, optimizes the use of the computer central unit. The first version of PROCOPES has been operational since 1974 and, since then, its evolution has been partly guided by the remarks or needs of users. The study of a more sophisticated command language is presented. The work was carried out, on now obsolescent hardware, within the framework of signal processing based on digitization, a processing method that has become generalized with the appearance of new hardware, such as Array Processors associated with minicomputers of the new generation. Two examples of the use of this command language are presented. The interest of integrating this tape of language into present-day hardware is discussed. Author (ESA)

N79-32884# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
A BRIEF GUIDE TO NPL ALGORITHMS LIBRARY, 1979
John R. A. Cooper Jan. 1979 63 p refs
(NPL-CSU-3/79) Avail: NTIS HC A04/MF A01

The NPL Algorithms Library aims to provide a collection of routines to perform the basic numerical processes required by computer users working in scientific disciplines. The library offers to external organizations, particularly British industry and commerce, government departments, and academic establishments, a simple means of drawing upon the expertise in computational mathematics available at NPL. This expertise has accumulated over many years through research and problem solving in a wide range of numerical topics. The NPL Algorithms Library contains extensive capabilities for solving linear algebraic equations and eigenproblems, optimizing general functions of many variables, fitting curves and surfaces to numerical data, and representating graphically functions and data. Many useful routines are also available for solving ordinary and partial differential equations, evaluating special functions, solving integral equations, integrating and interpolating functions, and analyzing numerical data. Author (ESA)

N79-32885# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
DEFINITION AND VERIFICATION OF COMPUTER NETWORK PROTOCOLS Ph.D. Thesis - Sussex Univ., England
Norman Victor Stenning Feb. 1979 359 p refs Co-sponsored by Sys. Designers Ltd.
(NPL-DNACS-15/79) Avail: NTIS HC A16/MF A01

The definition and verification of computer network protocols, with emphasis on those used for communication at the inter-computer and inter-process (host-host) levels are examined.

The need for a formal definition and verification methodology is shown and several existing techniques are surveyed. A common example protocol enables ready comparison between the various techniques which are discussed. A 'programming methodology' approach to protocol definition and verification, in which the protocol is defined by use of a programming language and verified by use of assertions, is given. Two detailed examples show the application of this technique, first in the case of a protocol which is used for data transfer on an established communication path, and second in the case of a protocol which is used to establish and terminate such paths (a 'connection control' protocol). Author (ESA)

N79-32886# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
DESIGN OF SOFTWARE TOOLS FOR MICROPROGRAMMABLE MICROPROCESSORS
Magnus Persson 1979 108 p refs
(TRITA-NA-79-03; TRITA-CS-79-02) Avail: NTIS HC A06/MF A01

A software system (MICGEN) for the programming of microprogrammable microprocessors is described. This totally interactive and easily used package consists of a general field oriented assembler, a simulator generator, and a code formatting program. A hypothetical bit slice architecture is presented. This architecture is used to demonstrate the software tools. The writing and debugging of two sample microprograms show how the package can be used. A user's manual for the generation and use of the entire MICGEN system is provided. Author (ESA)

N79-32887# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
ON NUMERICAL ANALYSIS IN SEMI-INFINITE PROGRAMMING
Sven-Aake Gustafson 1979 16 p refs
(TRITA-NA-79-07) Avail: NTIS HC A02/MF A01

The theoretical questions which arise from the computational treatment of semi-infinite are discussed. Fairly strong regularity assumptions are needed to insure satisfactory results from the computational schemes described. The concept of a dual pair of semi-infinite programs is introduced. The optimal solution of one of the programs is represented by an ordered N-tuple. For the other program the situation is more complex since one parameter may be arbitrarily large. A theorem is proved which shows that a semi-infinite program can be replaced by a linear program. This is the rationale behind the methods based on discretization where a semi-infinite program is approximated by a linear program. Discrete approximations of semi-infinite programs are also treated as are iterative schemes. Actual calculations prove effectiveness of these methods. Author (ESA)

62 COMPUTER SYSTEMS

Includes computer networks.

N79-32888 Rice Univ., Houston, Tex.
DYNAMIC REASSIGNMENT IN DISTRIBUTED PROCESSING SYSTEMS Ph.D. Thesis
James Bartlett Sinclair 1979 162 p
Avail: Univ. Microfilms Order No. 7919632

The problem of determining an optimal dynamic assignment for the execution of a modular program in a distributed processing system is considered. A dynamic programming algorithm is shown to find an optimal solution for the general problem, but its time and space complexities are exponential in the number of program modules. Pruning the dynamic assignment tree created by this algorithm results in an average space complexity much less than worst case. Also, a modification of this algorithm which emphasizes its equivalence to a shortest path algorithm can greatly reduce the number of computations by taking advantage of the stochastic nature of the sequence of module executions. In considering the modifield algorithm the concept of a constant bias LRU stack model which is analytically tractable and which can be related to actual program behavior in a straight forward manner is introduced. Dissert. Abstr.

N79-32889 Maryland Univ., College Park.
DEPENDENCY NETWORKS AS A REPRESENTATION FOR MODELLING IN GENERAL PROBLEM SOLVERS Ph.D. Thesis
Philip Edwin London 1978 237 p
Avail: Univ. Microfilms Order No. 7920753

A modelling mechanism based on a representation called dependency nets is developed and applied to a variety of problem solving processes including: (1) protection of subgoals; (2) partial plan modification; and (3) selection of objects. The description of the modelling techniques developed is embedded within the framework of a problem solving system based on the commonsense algorithm cause-effect representation for plans. The advantages of this scheme include the ability to update the model efficiently by tracing justifications for assertions altered, for example, by the anticipated effects of executing an action. Subgoal protection and partial plan modification techniques are derived from viewing the dependency net as a device for controlling inference. Object selection is viewed as the selection of appropriate bindings for variables in strategy schemata for which potential bindings are specified by symbolic descriptions. The implementation of the model as a computer program is examined. Dissert. Abstr.

N79-32890 California Univ., Santa Barbara.
ELEMENTS OF A THEORY OF COMPUTER SYSTEMS Ph.D. Thesis
Jerry Louis Dillion 1979 391 p
Avail: Univ. Microfilms Order No. 7921037

Elements of a computer systems theory based on computer structures, systems theory, sub atomic physics, and electrical engineering are given. A physical measure of the computational work of computer instructions is defined. Algorithms are derived of the absolute physical energy required by the hardware in implementing the instructions. The insights of quantum mechanics and tensor analysis are applied to the topics of computer space time. Computation energy and time for the command set of the Micro-data 1600 CPU are obtained. The efficiency of portions of the algorithm and architecture of the control structure for the 1600/20 emulation is evaluated. Examples are given of performance models relating cost, energy, and time, at various hierarchial levels. Normalized and binary utilization are defined, and a Boolean language for binary utilization is offered that applies to bus, control, and the general relationships defined above. Dissert. Abstr.

N79-32891# California Univ., Livermore. Lawrence Livermore Lab.
HIGH PERFORMANCE COMPUTER SYSTEMS
R. Bell, B. Buzbee, and G. Rodrigue Aug. 1978 7 p
(Contract W-7405-eng-48)
(UCID-17914) Avail: NTIS HC A02/MF A01

Research areas in mathematics and computer science for high-performance computer systems are described. The following five areas warrant further investigation: algorithm analysis for new computer architectures, architecture evaluation of advanced computer systems, high-level optimization of advanced computer systems, scientific application of high-performance computer systems, and systems analysis for high-performance computer systems. DOE

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N79-32892 New York Univ., N. Y.
AN ANALYSIS APPROACH TO DIFFUSION APPROXIMATIONS IN QUEUEING Ph.D. Thesis
David Yale Burman 1979 98 p
Avail: Univ. Microfilms Order No. 7918943

A technique for identifying the approximating diffusion process and yielding rigorous proofs of the convergence of the finite dimensional distribution of the queueing process to the approximating diffusion process is developed. This approach is applied to

obtain diffusion approximations for four processes: (1) renewal processes; (2) single server queues with Poisson arrivals and general service times; (3) general K-server queueing systems; and (4) networks of queues. Supplementary variables are appended to X sub n (+) to produce a sequence of Markov processes. The generator, A sub n converges. For a function g there is a sequence of functions g sub n approaches g such that A sub n g sub n approaches A sub infinity g where a sub infinity is the generator of the diffusion process. It is shown that this convergence of the generator implies that the finite dimensional distributions converge. Dissert. Abstr.

N79-32893 Polytechnic Inst. of New York, Farmingdale.
A CONTRIBUTION TO DIFFUSION THEORY WITH APPLICATIONS Ph.D. Thesis
Hajrudin Beca 1979 173 p
Avail: Univ. Microfilms Order No. 7920768

Motivated by the use of the diffusion processes as approximate models for solving queueing problems in computer-communication networks, the main objective is to establish a unified approach to the solutions for transition probabilities of diffusion processes. These processes are modelled by continuous-time and discrete- or continuous-state Markov processes for which the probability of transition from a given state to all the other states within a preselected small distance, during an infinitesimal interval of time, is one. By introducing the generalized Fourier series approximation for the solution to the Fokker-Planck equations in the scalar and vector forms (or the equivalent partial differential-difference equations in the cases of discrete-state diffusion processes), efficient numerical approaches are evolved. The choice of the orthonormal basis in the generalized Fourier series is discussed. Dissert. Abstr.

N79-32894 California Inst. of Tech., Pasadena.
COMPUTATIONAL STRUCTURES FOR EXTRACTING EDGE FEATURES FROM DIGITAL IMAGES FOR REAL-TIME CONTROL APPLICATIONS Ph.D. Thesis
Vincent Sydney Wooi-Yee Wong 1979 155 p
Avail: Univ. Microfilms Order No. 7920358

Extracting edge features from digital images was investigated for real-time control applications. A sequence of image operations is presented for extracting edge features from a digital image. This sequence emphasizes intensity edges, isolates them from the rest of the image and then converts them into line data structures for further analysis by a higher-level vision processor. This way, an image of 500 x 500 pixels is reduced to a few hundred data elements. In order to extract edge features from digital images fast enough for real-time use, some consideration was given to the computation structures for performing the edge-extraction operations. Past attempts at constructing parallel processing arrays to speed up image processing are summarized. It is concluded that array processing is unsuitable for real-time image processing. Dissert. Abstr.

N79-32895# Naval Postgraduate School, Monterey, Calif.
HEAVY TRAFFIC RESULTS FOR SINGLE SERVER QUEUES WITH DEPENDENT EARMA SERVICE AND INTERARRIVAL TIMES
P. A. Jacobs Apr. 1979 38 p refs
(AD-A070086; NPS55-79-009) Avail: NTIS HC A03/MF A01 CSCL 12/2

Models are given for sequences of correlated exponential interarrival and service times for a single server queue. These multivariate exponential models are formed as probabilitic linear combinations of sequences of independent exponential random variables and are easy to generate on a computer. Limiting results for customer waiting time under heavy traffic conditions are obtained for these queues. Heavy traffic results are useful for analyzing the effect of correlated interarrival and service times in queues on such quantities as queue length and customer waiting time. They can also be used to check simulation results. GRA

N79-32896# Colorado Univ., Boulder. Dept. of Electrical Engineering.
QUANTITATIVE SYNTHESIS OF MULTIPLE LOOP FEEDBACK SYSTEMS WITH LARGE UNCERTAINTY Interim Report
Isaac Horowitz and Te-Shing Wang May 1979 78 p refs
(Grant AF-AFOSR-2946-76; AF Proj. 2304)
(AD-A070273; Rept-3; AFOSR-79-0702TR) Avail: NTIS HC A05/MF A01 CSCL 09/4

This work extends single input-output linear time invariant minimum-phase 'quantitative feedback synthesis' to two new complex plant structures with internal sensing points. One is the triangular structure. The second consists of parallel branches, each with cascaded sections. Due to uncertainty, the plant parameters are elements of given sets. The system response must satisfy specified time or frequency domain tolerances. The basic problem is how to divide the feedback burden among the available loops so as to minimize the net rms effect at the plant input, of the various sensor noise sources. Frequency-response formulations are presented which provide a deep understanding of the trade-off among the feedback loops. One vital feature is 'free uncertainty', wherein a loop optimized to cope with uncertainty U(1), may in fact for some frequency ranges, handle uncertainty U >> U(1). A second is 'bandwidth propagation', wherein the loops take turns in dominating the design over the frequency range. Together, they locate the frequency regions in which the respective loops dominate, and the key trade-off parameters among them. 'Design Perspective' then enables the designer to very rapidly find a close approximation to the precise design based on any choice of these parameters. Numerous design examples with very large uncertainty, illustrate the design procedures and the advantages of multiple-loop design. GRA

N79-32897# Ohio State Univ., Columbus. Dept. of Industrial and Systems Engineering.
IDENTIFICATION OF FINITE STATE MODELS OF HUMAN OPERATORS Final Report, 1 Oct. 1976 - 31 Dec. 1978
Richard A. Miller 1 Mar. 1979 245 p refs
(Grant AF-AFOSR-3152-77; AF Proj. 2312)
(AD-A070079; OSURF-760518/784556; AFOSR-79-0703TR)
Avail: NTIS HC A11/MF A01 CSCL 12/1

The problems of modelling a class of manned systems in which the operator or operators have available only a finite number of decision alternatives which they can use to control the system configuration and mode of operation over time are the focus of this report. An abstract system theoretic structure suitable for representing such discrete control systems is developed and the structure is used to organize the analysis of data obtained from a man-in-the-loop simulation of an AAA system. The structure used to define discrete control is a hierarchical/heterarchical network of finite state systems. The nodes in this network represent system components, task and activities. Several levels of abstraction are used which means that both macroscopic and microscopic descriptions are possible. The structure captures the certain aspects of coordination and the flow of decision making activity through the system. The feasibility of discrete control modelling is demonstrated. The structural aspects, particularly knowledge representation and the identification of key decision points, seem quite powerful. The statistical and data analysis procedures work successfully but need further refinement if model construction is to be maximally efficient. GRA

N79-32898# Brown Univ., Providence, R. I. Center for Dynamical Systems.
NUMERICAL METHODS AND APPROXIMATION AND MODELLING PROBLEMS IN STOCHASTIC CONTROL THEORY Final Report
Harold J. Kushner and Wendell H. Fleming 1979 7 p refs
(Grant AF-AFOSR-3063-76; AF Proj. 2304)
(AD-A070038; AFOSR-79-0720TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Research was done on diffusion processes depending on small parameters and on optimal stochastic control. Another area of research was in measure-valued diffusion processes. Work was completed in the area of stochastic control and in optimality conditions for stochastic systems under partial observations. Work was completed dealing with the approximation and computational problem for the average cost per unit time problem for a diffusion model. A monograph was published dealing with constrained and unconstrained problems of the stochastic approximation type. GRA

N79-32899# University of Southern California, Los Angeles. Image Processing Inst.
REAL-TIME NONLINEAR OPTICAL INFORMATION PROCESSING
Ahmad Armand Jun. 1979 170 p refs
(Grant AF-AFOSR-3285-77)
(AD-A071541; USCIPI-880) Avail: NTIS HC A08/MF A01 CSCL 05/8

Existing methods for nonlinear optical processing involve an intermediate photographic step which prevents real-time operation. Although optical information processors have a large space-bandwidth product, the problem of real-time input has been a major limitation in taking advantage of this processing ability. In this research, the realization of nonlinear optical processing in real time is investigated. Several techniques for performing such operations are presented. One approach realizes the halftone method of nonlinear optical processing in real time by replacing the conventional photographic recording medium with a real-time image transducer. In the second approach halftoning is eliminated and the real-time device is used directly. In this case the nonlinearity is obtained by the inherent nonlinear characteristic of the real-time device. A third method uses the ability of certain real-time devices to perform an intensity-to-spatial frequency conversion. GRA

N79-32900# North Carolina Univ., Chapel Hill. Inst. of Statistics.
QUEUES AND STORES WITH NONHOMOGENEOUS INPUT Ph.D. Thesis
Donna Katzman McClish Apr. 1979 175 p refs
(Contract N00014-76-C-0550)
(AD-A069550; MIMEO-SER-1225) Avail: NTIS HC A08/MF A01 CSCL 12/1

It is shown that under a variety of circumstances, the presence of a periodic pattern of input is enough to insure that a quasi-limiting distribution of store content exists. For stores with nonhomogeneous compound Poisson input and general release rule, a probabilistic approach is developed which allows equations to be written down easily for such quantities as the mean store content and the probability of an empty store. For at least some instances of the M(t)/M/1 queue it is shown that the approximations are very good. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N79-32901 Polytechnic Inst. of New York.
OSCILLATION THEORY OF SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS Ph.D. Thesis
Roy Stuart Freedman 1979 101 p
Avail: Univ. Microfilms Order No. 7920778

The theory of conjugate and focal points is generalized to linear and special nonlinear systems of differential equations. Both linear and nonlinear systems are characterized by a property called genericity. For the conjugate and focal points to be independent of initial conditions, it is necessary for the nonlinear systems to satisfy special conditions. Some sufficient conditions in this respect are developed. The notion of condensation which resembles the concentration of zeroes in the linear scalar case is introduced, and it is shown that the conjugate point satisfies an extremality condition. Various differentiation formulas are given for the conjugate and focal point functions as well as conditions for their applicability. All notions developed are extended to nongeneric systems and nonhomogeneous linear systems. The nonlinear and linear dynamical systems seen often in control theory are also examined. Dissert. Abstr.

N79-32902 California Inst. of Tech., Pasadena.
UNITARY BLOCK DIAGONALIZATION AND THE CHARACTERISTIC POLYNOMIAL OF A PENCIL GENERATED BY HERMITIAN MATRICES Ph.D. Thesis
Helene Marian Shapiro 1979 127 p
Avail: Univ. Microfilms Order No. 7920347

The problem of simultaneously putting a set of square matrices into the same block upper triangular form with a similarity transformation is discussed and a result linking the size of the largest block to polynomial identities is obtained. To study the problem of unitarily, block diagonalizing the matrix A, the pair of Hermitian matrices H and K is considered. The pencil $xH + yK$ and the characteristic polynomial of this pencil, $f(x,y,z) = \det(zI - xH - yK)$ are studied. It is shown that if $f(x,y,a)$ has a repeated linear factor of high enough multiplicity, then H and K have a common eigenvector. It is also shown that if $f(x,y,z)$ is a power of a quadratic polynomial, then H and K are simultaneously, unitarily similar to block diagonal matrices, each of which is a sum of identical 2 x 2 blocks. For $h < or = 5$, it is verified that if $f(x,y,z)$ has a repeated factor, then A is unitarily similar to a matrix which is block diagonal. Dissert. Abstr.

N79-32903 Wisconsin Univ. - Madison.
SEARCHING FOR SOLUTIONS OF FINITE NONLINEAR SYSTEMS: AN INTERVAL APPROACH Ph.D. Thesis
Sandie Turner Jones 1978 147 p
Avail: Univ. Microfilms Order No. 7916556

A method designed to search systematically for solutions of nonlinear systems of the form $f(x) = 0$ and chi belongs to the set omega prime where omega prime is an arbitrary n dimensional rectangular region in the domain of f is described. The method combines the techniques of interval analysis with an n dimensional bisection procedure. Under certain conditions, the method either produces an n dimensional rectangular region, contained in omega prime, which is a safe starting region for the iterative solution of $f(x) = 0$ or determines that no solution exists in omega prime. Further, it can do so in a finite number of steps. The method is applied, in conjunction with a particular iterative algorithm, to problems for which f is a rational function of n variables. The approach is general in the sense that it is applied, in conjunction with any iterative algorithm having computationally verifiable sufficient conditions for existence of solutions and convergence, to any function f for which appropriate interval extensions can be computed. Dissert. Abstr.

N79-32904 Maryland Univ., College Park.
ALGORITHMS FOR DISCOVERING HIERARCHICAL RELATIONSHIPS AMONG DICHOTOMOUS ITEMS Ph.D. Thesis
Lewis Charles Price 1978 219 p
Avail: Univ. Microfilms Order No. 7920728

Two computerized algorithms based on a probabilistic model were developed for discovering hierarchical relationships that exist among a set of dichotomously scored items. The two approaches incorporate statistical criteria for selecting incorrect - correct pattern vectors to form the subset of the total possible patterns which uniquely describes the hierarchy. The algorithms were applied to 270 different data sets systematically varied on a number of parameters. The performances of the algorithms were compared to three competing deterministic algorithms on the basis of the degree to which the discovered pattern vector set agreed with the true generated set. For five and seven items the two probabilistic algorithms were superior in performance. The probabilistic algorithms also discovered pattern vector sets which provided very good statistical fit to real data sets. Dissert. Abstr.

N79-32905 Polytechnic Inst. of New York, Farmingdale.
ROBUST DETECTORS BASED ON THE OCCUPANCY VECTOR Ph.D. Thesis
Richard E. Albright 1979 199 p
Avail: Univ. Microfilms Order No. 7920766

Several classes of robust detectors based on the occupancy vector are studied. The detectors operate at near optimum levels for a particular design environment and are robust, maintaining nearly uniform levels of performance for a wide variety of environments. Two-sample m-interval tests are derived from asymptotic expansion of the likelihood ratio test on the occupancy vector. The most significant terms are extracted from the expansion to yield locally most powerful (small signal) linear and quadratic two-sample tests. Several applications for the m-interval detectors are investigated, including problems in communication, spectral data processing, statistical data analysis, and image processing. Dissert. Abstr.

N79-32906*# Michigan Univ., Ann Arbor. Systems Engineering Lab.
PERFORMABILITY MODELING WITH CONTINUOUS ACCOMPLISHMENT SETS
John F. Meyer Jul. 1979 32 p refs
(Grant NsG-1306)
(NASA-CR-162323; Rept-014524-10-T; SEL-137) Avail: NTIS HC A03/MF A01 CSCL 12A

A general modeling framework that permits the definition, formulation, and evaluation of performability is described. It is shown that performability relates directly to system effectiveness, and is a proper generalization of both performance and reliability. A hierarchical modeling scheme is used to formulate the capability function used to evaluate performability. The case in which performance variables take values in a continuous accomplishment set is treated explicitly. K.L.

N79-32907*# Stanford Univ., Calif. Dept. of Computer Science.
NOTE ON THE PRACTICAL SIGNIFICANCE OF THE DRAZIN INVERSE
J. H. Wilkinson Apr. 1979 21 p refs
(Grant NsG-1443)
(NASA-CR-162307; STAN-CS-79-736) Avail: NTIS HC A02/MF A01 CSCL 12A

The solution of the differential system Bx = Ax + f where A and B are n x n matrices, and A - Lambda B is not a singular pencil, may be expressed in terms of the Drazin inverse. It is shown that there is a simple reduced form for the pencil A - Lambda B which is adequate for the determination of the general solution and that although the Drazin inverse could be determined efficiently from this reduced form it is inadvisable to do so. Author

N79-32908# Wisconsin Univ. - Madison. Mathematics Research Center.
A COMPARISON OF THE EXISTENCE THEOREMS OF KANTOROVICH AND MOORE Summary Report
L. B. Rall Mar. 1979 22 p refs
(Contract DAAG29-75-C-0024)
(AD-A070203; MRC-TSR-1944) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report shows a way to save money in the evaluation of accuracy of approximate solutions of finite systems of nonlinear algebraic and transcendental equations, based on the comparison of an older method for this purpose with a newer one. It is shown that the two methods are theoretically about equally effective, while the newer one is cheaper computationally. This conclusion has been verified in practice, using operational UNIVAC 1108/1110 software. GRA

N79-32909# Wisconsin Univ. - Madison. Mathematics Research Center.
THEORY OF CONNECTIVITY: A UNIFIED APPROACH TO BOUNDARY METHODS Summary Report
Ismael Herrera Mar. 1979 12 p refs
(Contract DAAG29-75-C-0024)
(AD-A070198; MRC-TSR-1938) Avail: NTIS HC A02/MF A01 CSCL 12/1

A theory of connectivity recently developed by the author, is described briefly, and a unified formulation of boundary methods is presented. Boundary integral equations and series expansions in terms of a basic set of functions are among approaches included in this unified formulation. The theory of connectivity is exhibited as a useful tool to discuss questions of completeness of the basic set of functions and of convergence of the approximating procedures; in addition, it supplies a systematic formulation of variational principles for these kinds of problems. GRA

N79-32910# Wisconsin Univ. - Madison. Mathematics Research Center.
EFFICIENT HIGHER ORDER SINGLE STEP METHODS FOR PARABOLIC PROBLEMS, PART 1 Summary Report
James H. Bramble and Peter H. Sammon May 1979 34 p refs
(Contract DAAG29-75-C-0024; Grants NSF MCS-76-07236; NSF MCS-78-09525)
(AD-A070217; MRC-TSR-1958-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 12/1

Some efficient, high order methods are discussed for approximating the solution of an initial boundary value problem for a homogeneous parabolic equation with time dependent coefficients. The methods are based on Galerkin-type approximations in the spatial variables and single step methods in the time variable. The equations defining the time stepping procedure are solved only approximately however. A preconditioned iterative technique is used for this purpose. The resulting algorithm is shown to produce optimal order approximations using only the order of work required by the single step method applied to the parabolic problem with time independent coefficients. GRA

N79-32911# Kentucky Univ., Lexington. Dept. of Mathematics.
SOME ALGORITHMIC PROBLEMS IN LINEAR SYSTEMS, 1 Interim Report
Anders Lindquist Mar. 1979 11 p refs
(Grant AF-AFOSR-3519-78; AF Proj. 2304)
(AD-A070138; AFOSR-79-0719TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A comprehensive study of the stochastic realization problem was undertaken both in its algorithmic and structural aspects. A geometric state space theory of linear stochastic systems was obtained, providing a complete characterization of all stochastic realizations. The phenomenon of invariant directions of the matrix Riccati equation was investigated in this framework, clarifying its connections to filtering algorithms as well as to geometric aspects of linear systems theory. Non-Riccati algorithms for generating spectral factors were introduced. Work was initiated to develop a comprehensive framework for algorithms of this type through transformations in Hamiltonian systems. GRA

N79-32912# Washington Univ., Seattle. Dept. of Mathematics.
ON THE COMPLEXITY OF d-DIMENSIONAL VORONOI DIAGRAMS
Victor Klee Mar. 1979 13 p refs
(Contract N00014-67-A-0103; NR Proj. 044-353)
(AD-A070098; TR-64) Avail: NTIS HC A02/MF A01 CSCL 12/1

For n points p1,..., pn of Euclidean d-space E superscript d, the associated Voronoi diagram V(p1,...,pn) is a sequence (P1,...,Pn) of convex polyhedra covering E superscript d, where pi consists of all points of E superscript d that have pi as a nearest point in the set (p1,...,pn). Voronoi diagrams in E superscript 2 have been of interest because of their use by Shamos and others in providing efficient algorithms for a number of computational problems. The efficiency depends on the fact that the diagram itself can be computed efficiently (in time O(n log n) when d = 2). The present paper deals with the complexity of Voronoi diagrams based on n points of E superscript D. GRA

N79-32913# Wisconsin Univ. - Madison. Mathematics Research Center.
COLLOCATION APPROXIMATION TO EIGENVALUES OF AN ORDINARY DIFFERENTIAL EQUATION: THE PRINCIPLE OF THE THING
Carl deBoor and Blair Swartz Mar. 1979 24 p refs
(Contracts DAAG29-75-C-0024; W-7405-eng-36)
(AD-A070197; MRC-TSR-1937) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is shown that simple eigenvalues of an m-th order ordinary differential equation are approximated within O(absolute value of delta to the 2k power) by collocation at Gauss points with piecewise polynomial functions of degree are less than m plus k on a mesh delta. The same rate is achieved by certain averages in case the eigenvalue is not simple. The argument relies on an extension and simplification of Osborn's recent results concerning the approximation of eigenvalues of compact linear maps. GRA

N79-32914# Naval Postgraduate School, Monterey, Calif.
AN EFFICIENT METHOD FOR SOLVING STIFF TRANSIENT FIELD PROBLEMS ARISING FROM FEM FORMULATIONS Technical Report, Jan. - Mar. 1979
Richard Franke and David Salinas 30 Mar. 1979 20 p refs
Presented at 2nd Intern. Conf. on Computational Methods in Nonlinear Mech., Austin, Tex., 26-30 Mar. 1979

(RR0000101)
(AD-A070085; NPS53-79-002) Avail: NTIS HC A02/MF A01 CSCL 12/1

The method chosen for the solution of stiff systems is a version of Gear's method which solves the system in its implicit form. This leads to the necessity of being able to solve (repeatedly) linear algebraic equations whose coefficient matrix has the same sparse and banded nature as (A sub ij). Storage requirements for various orders of polynomial triangular elements under compact storage mode, profile storage mode, and banded symmetric storage mode are given and compared. For large systems, compact storage mode leads to significantly reduced requirements. Linear algebraic systems which arise in Gear's method are considered revealing that iteration should be computationally efficient. A comparison between various solution methods is given for a nonlinear nuclear reactor dynamic problem. Associated with each solution method is a different storage mode. J.M.S.

N79-32915# Naval Air Test Center, Patuxent River, Md.
MULTIDIMENSIONAL QUADRATURE FORMULAS USING PARTIAL DERIVATIVES Progress Report, Oct. 1976 - Oct. 1977
Wayne E. Hoover and J. Sutherland Frame 25 May 1979 40 p refs
(AD-A070582; NATC-TM-78-2-CS) Avail: NTIS HC A03/MF A01 CSCL 12/1

Conventional multidimensional quadrature formulas employ a weighted sum of function values to approximate a multiple integral over a hyperrectangle. This paper considers the problem of enhancing the traditional formulas by the addition of certain partial derivative correction terms evaluated on the boundary of the domain of integration. Numerical results for double and triple integrals indicate the formulas of degrees of precision 3 and precision 5 are both accurate and efficient. GRA

N79-32916# Washington Univ., Seattle. Dept. of Mathematics.
DIAMETERS OF RANDOM GRAPHS
Victor Klee Mar. 1979 42 p refs
(Contract N00014-67-A-0103)
(AD-A070099; TR-65) Avail: NTIS HC A03/MF A01 CSCL 12/1

In addition to being of interest for its own sake, the study of random graphs provides the combinatorial foundation for investigations of the average-case behavior of various graph-theoretic algorithms. Diameters of graphs are especially relevant to algorithms based on breadth-first search. The present paper deals with the family G approximate (n,E) of all labeled graphs that have n nodes and E edges. GRA

N79-32917# Washington Univ., Seattle. Dept. of Mathematics.
RANDOM BIPARTITE GRAPHS: CONNECTEDNESS, ISOLATED NODES, DIAMETERS
Victor Klee and David Larman Apr. 1979 25 p refs
(Contract N00014-67-A-0103)
(AD-A070100; TR-66) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let B(m,n,E) denote the family of all labeled bipartite graphs that have m nodes in the first part and n nodes in the second, with exactly E edges. If the postive integers m(1), m(2),... and E(1), E(2),... are such that m(n) is less than or = n and E(n) is less than or = m(n)n for all n, and lim inf as n approaches infinity E(n)/(n log n) is greater than 1, then the probability that a random member of B approximate (m(n),n,E(n)) is connected converges to 1 as n approaches infinity. Results on isolated nodes and on diameters are also obtained. Author (GRA)

N79-32918# Wisconsin Univ. - Madison. Mathematics Research Center.
SOME RELATIONS BETWEEN NONEXPANSIVE AND ORDER PRESERVING MAPPINGS Summary Report
Michael G. Crandall and Luc Tartar Mar. 1979 12 p refs
(AD-A070202; MRC-TSR-1943) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is shown that nonlinear operators which preserve the integral are order preserving if and only if they are nonexpansive in L(1) and that those which commute with translation by a constant are order preserving if and only if they are nonexpansive in L(infinity). Examples are presented and involving partial differential equations, difference approximations and rearrangements. GRA

N79-32919# Wisconsin Univ. - Madison. Mathematics Research Center.
VARIATIONAL PRINCIPLES FOR PROBLEMS WITH LINEAR CONSTRAINTS. PRESCRIBED JUMPS AND CONTINUATION TYPE RESTRICTIONS
Ismael Herrera Mar. 1979 31 p refs
(Contract DAAG29-75-C-0024)
(AD-A070199; MRC-TSR-1939) Avail: NTIS HC A03/MF A01 CSCL 12/1

A general theory of the problems subjected to linear constraints is developed. As applications, a problem for which the solutions are required to satisfy prescribed jumps and another one whose solutions are restricted to be such that they can be continued smoothly into solutions of given equations in neighboring regions, are formulated abstractly. General variational principles for these types of problem are reported. In addition it is shown that sets of functions that can be extended in the manner explained above constitute, generally, completely regular subspaces, here defined. These results have a bearing on boundary methods which are being developed for treating numerically partial differential equations associated with many problems of Science and Engineering. Author (GRA)

N79-32920# Wisconsin Univ. - Madison. Mathematics Research Center.
ERROR ESTIMATES FOR MIXED METHODS
R. S. Falk and J. E. Osborn Mar. 1979 35 p refs
(Contract DAAG29-75-C-0024; Grants NSF MCS-78-02851; NSF MCS-78-02737)
(AD-A070196; MRC-TSR-1936) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper presents abstract error estimates for mixed methods for the approximate solution of elliptic boundary value problems. These estimates are then applied to obtain quasi-optimal error estimates in the usual Sobolev norms for four examples: three mixed methods for the biharmonic problem and a mixed method for 2nd order elliptic problems. GRA

N79-32921# Wisconsin Univ. - Madison. Mathematics Research Center.
ASYMPTOTIC DISTRIBUTIONS OF SLOPE OF GREATEST CONVEX MINORANT ESTIMATORS
Sue Leurgans Apr. 1979 27 p refs
(Contract DAAG29-75-C-0024; Grants NSF MCS-77-16974; NSF MCS-78-09525)
(AD-A070205; MRC-TSR-1946) Avail: NTIS HC A03/MF A01 CSCL 12/1

Isotonic estimation involves the estimator of a function which is known to be increasing with respect to a specified partial order. For the case of a linear order, a general theorem is given which simplifies and extends the techniques of Prakasa Rao (1966) and Brunk (1970). Sufficient conditions for a specified limit distribution to obtain are expressed in terms of a local condition and a global condition. The theorem is applied to several examples. The first example is estimation of a monotone function mu on (0,1) based on observations (i/n, X sub ni), where EX sub ni = mu (i/n). In the second example, i/n is replaced by random T sub ni. Robust estimators for this problem are described. Estimation of a monotone density function is also discussed. It is shown that the rate of convergence depends on the order of first non-zero derivative and that this result can obtain even if the function is not monotone over its entire domain. GRA

N79-32922# Wisconsin Univ. - Madison. Mathematics Research Center.
EFFICIENT TIME-STEPPING METHODS FOR MISCIBLE DISPLACEMENT PROBLEMS WITH NONLINEAR BOUNDARY CONDITIONS
Richard E. Ewing Apr. 1979 26 p
(Contract DAAG29-75-C-0024; Grants DAAG29-78-G-0161; NSF MCS-78-09525)
(AD-A070211; MRC-TSR-1952) Avail: NTIS HC A03/MF A01 CSCL 12/1

Efficient procedures for time-stepping Galerkin methods are

considered for approximating the solution of a coupled nonlinear system with nonlinear Neumann boundary conditions. Possible model systems are shown for describing the miscible displacement of one incompressible fluid by another in a porous medium when flow conditions are prescribed on the boundary. The procedures involve the use of a preconditioned iterative method for approximately solving the different linear systems of equations arising at each time step in a discrete-time Galerkin method.
GRA

N79-32923# Wisconsin Univ. - Madison. Mathematics Research Center.
ON SYSTEMS OF TODA TYPE
W. Symes May 1979 69 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS-78-09525)
(AD-A070216; MRC-TSR-1957) Avail: NTIS HC A04/MF A01 CSCL 12/1

This report presents a group-theoretical interpretation of the structure of certain completely integrable Hamiltonian systems. These systems generalize the nonperiodic Toda Lattice system. Since all of them owe their special properties to the same group-theoretical mechanism, we call them systems of Toda type. This mechanism also provides a foundation for understanding many other completely integrable systems, including the Korteweg-de Vries equations, which will not be discussed here. We give an invariant definition of the class of systems of Toda type, and a method for explicit integration of all systems in this class in terms of rational combinations of linear exponential functions.
GRA

N79-32924# Sandia Labs., Albuquerque, N. Mex.
BRIEF INSTRUCTIONS FOR USING THE SANDIA MATHEMATICAL SUBROUTINE LIBRARY (VERSION 7.2)
K. H. Haskell and R. E. Jones Jun. 1978 246 p
(Contract EY-76-C-04-0789)
(SAND-77-1441) Avail: NTIS HC A11/MF A01

The Sandia Numerical Mathematical Subroutine Library consists of a number of dependable, high-quality, general-purpose mathematical computing routines. A brief description is presented of how to select and use each routine in the current library (version 7.2) on the CDC 6600, and NOS system.
DOE

N79-32925# Sandia Labs., Albuquerque, N. Mex.
SLINEQ: A CODE TO SOLVE SYSTEMS OF LINEAR EQUATIONS AND INEQUALITIES
K. L. Hiebert Aug. 1978 25 p refs
(Contract EY-76-C-04-0789)
(SAND-78-1442) Avail: NTIS HC A02/MF A01

The code SLINEQ is described which determines whether or not a system of linear equations and inequalities is consistent and, if consistent, calculates a solution (feasible point) to it. This problem often occurs as a subproblem to a constrained optimization problem when the technique used to solve the optimization problem requires an initial feasible point. Included are a short user's guide to the code, example calling program, the results of testing designed to determine the efficiency and reliability of SLINEQ, and a listing of both the FLECS and FORTRAN versions of the code.
DOE

N79-32926# National Aerospace Lab., Amsterdam (Netherlands). Scientific Services Dept.
ON THE USE OF SPLINE FUNCTIONS AND COLLOCATION IN A TRAJECTORY OPTIMIZATION ALGORITHM BASED ON MATHEMATICAL PROGRAMMING
J. J. Renes 9 Feb. 1978 23 p refs
(NLR-TR-78016-U) Avail: NTIS HC A02/MF A01

Spline approximations, applied to state and control functions independently, and collocation of the differential equations of motion yields a mathematical programming problem for the unknown spline coefficients. The optimal choice of spline knots and collocation points for such an approach and the calculation of the gradients used in a mathematical programming solver are described. The application of this analysis technique to flight path optimization is emphasized.
Author (ESA)

N79-32927# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
SOME LINEAR DIFFERENTIAL EQUATION PROBLEMS IN THE ANALYSIS OF DISSOLVED SPECIES IN CRACKS
D. H. Feriss Jan. 1979 13 p refs
(NPL-DNACS-14/79) Avail: NTIS HC A02/MF A01

Integral transform techniques are used to obtain solutions to partial differential equations arising in the analysis of diffusion of dissolved species in cracks in metals. The problems considered include steady and unsteady diffusion in one or two space dimensions for parallel sided cracks and steady one dimensional diffusion in a tapered crack.
Author (ESA)

N79-32928# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
THE AQ ALGORITHM FOR THE SOLUTION OF A SPARSE SYSTEM OF LINEAR EQUATIONS
R. E. Borland Mar. 1979 45 p refs
(NPL-DNACS-17/79) Avail: NTIS HC A03/MF A01

A method for the solution of a system of linear equations is described. It is based on an LQ factorization of the coefficient matrix A. Most of the lower triangular matrix L is not calculated directly; instead it is used in the form L = AQ transposed. For a suitably reordered sparse A, the orthogonal matrix Q has a concise representation. It is shown that this can be exploited to yield a stable, adaptable, and efficient method for the solution of sparse equations.
Author (ESA)

N79-32929# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Computer Sciences.
A CLASS OF FINITE ELEMENT METHODS FOR ADVECTION-DIFFUSION PROBLEMS WITH SMALL DIFFUSION
Claes Johnson and Uno Naevert 1978 13 p refs
(CTH-79.01-R) Avail: NTIS HC A02/MF A01

A class of stable finite element methods that are higher-order accurate for the dominating advection terms and first order accurate for the diffusion terms is proposed. In the simplest case, these methods correspond to finite difference methods with centered differencing for advection terms and down-wind differencing for diffusion terms.
Author (ESA)

N79-32930# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
INTEGRAL KERNELS AND APPROXIMATION ON TOTALLY REAL SUBMANIFOLDS OF VECTOR SPACE EXPONENT n
Bo Berndtsson 1979 10 p refs
(CTH-Math-1979-1) Avail: NTIS HC A02/MF A01

A proof is given of the theorem by Hormander-Wermer-Harvey-Wells which asserts that any function which is continuous on a compact subset of a totally real submanifold of vector space exponent n can be approximated there arbitrarily well in the supreme norm by functions that are holomorphic in a neighborhood of that compact. The proof is based on a formula which represents a probability from zero to infinity function phi in terms of alpha phi by means of an integral kernel.
Author (ESA)

N79-32931# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
ANALYTIC APPROXIMATION OF CONCAVE FUNCTIONS
Birger Faxen 1979 7 p refs
(CTH-Math-1979-2) Avail: NTIS HC A02/MF A01

It is proved that an increasing, concave function f(x) on zero, infinity can be approximated from below by an increasing, concave function g such that g has an analytic extension to a sector absolute valve of arg Z < v, g' is bounded there, and the integral of 1 to infinity (f(x)-g(x)) dx/x squared < infinity. If, an addition, f'(0) < infinity, then it is possible to have the integral of zero to infinity (f(x)-g(x)) dx/x squared < infinity.
Author (ESA)

N79-32932# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
ON RECURRENCE OF A RANDOM WALK IN THE PLANE
Kai Lai Chung and Torgny Lindvall 1979 6 p refs
(CTH-Math-1979-4) Avail: NTIS HC A02/MF A01

In 1962, Chung and Ornstein gave a probabilistic proof of the fact that S sub N/N for P as it approaches zero in probability is sufficient for recurrence of a one dimensional random walk (S sub N) zero to infinity. A sufficient condition for recurrence in the plane is established, yielding that if S sub N/square root

of N is asymptotically normal, then there is recurrence.
Author (ESA)

N79-32933# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
A PROPOSAL FOR THE USE OF NEW PARALLEL MULTIPLICATION AND DIVISION ALGORITHMS, MODELED AFTER EGYPTIAN AND BABYLONIAN PROTOTYPES
Joeran Friberg 1979 39 p refs
(CTH-Math-1979-5) Avail: NTIS HC A03/MF A01

The introduction into the Swedish school system of division algorithm as well as a multiplication algorithm which is as parallel as possible in its written form to the division one is suggested. Ease of comprehension and pedagogical advantages are noted. The fact that the ancient Egyptian algorithms for multiplication and for division were practically identical is cited. A rapid sketch of the history of the algorithms for multiplication and division that have been in use in European and American schools since the fifteenth century and even earlier is then given. Author (ESA)

N79-32934# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
A NEW PROOF OF A MUENTZ-TYPE THEOREM OF KOREVARR AND DIXON
Magnus Lundin 1979 10 p refs
(CTH-Math-1979-7) Avail: NTIS HC A02/MF A01

Korevaar and Dixon proved a result about the nonspanning of the exponentials e exponents (lambda Z sub N) on a curve gamma. Another proof of this result, using methods on analytic arcs, and for more general curves, but less general classes brace lambda sub N brace, is given. Author (ESA)

N79-32935# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
A DETERMINISTIC MODEL IN BIOMATHEMATICS. ASYMPTOTIC BEHAVIOR AND THRESHOLD CONDITIONS
Gunnar Aronsson and Ingvar Mellander 1979 24 p refs
(Contract SWED-NSRC-F-2569-007)
(CTH-Math-1979-8) Avail: NTIS HC A02/MF A01

A deterministic multigroup model for the spread of infectious diseases is studied. The model is of SIS-type (incubation and immunity are neglected) and allows seasonal variations in contact and recovery rates. Depending on the spectrum of a certain matrix there are two possibilities. Either the disease dies out naturally for every initial stage, or the disease prevalence in each group will approach a periodic (seasonal) fluctuation, provided the disease is present initially. This result generalizes a threshold condition by Lajmanovich and Yorke for the autonomous case (no seasonal variation). Author (ESA)

N79-32936# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
APPROXIMATION OF e EXPONENT -x BY RATIONAL FUNCTIONS WITH CONCENTRATED NEGATIVE POLES
Jan-Erik Andersson 1979 11 p refs
(CTH-Math-1979-9) Avail: NTIS HC A02/MF A01

The degree of uniform approximation of e exponent -x on the positive real axis by rational functions is estimated. These functions are restricted to the form p(x) (x+ng sub N), exponent -N where p(x) is a polynomial of degree at most n and 2 sub N is a positive real number. Letting 2 sub N be the degree of approximation, the lower limit p sub N exponent 1/N and the upper limit p sub N exponent -1/N for an arbitrary sequence (q sub N) 1 to infinity is determined. In particular, it is shown that the lower limit p sub N exponent 1/N > or = to the (square root of 2)-1 and that taking q sub N = 1/- square root of Z, N = 1, Z, ..., the limit p sub N exponent 1/N = the (square root of Z)-1 is obtained. This result yields a strengthening of an earlier result by Saff, Schoenhge, and Varga. Author (ESA)

N79-32937# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
ON COUPLING OF CONTINUOUS TIME RENEWAL PROCESSES
Torgny Lindvall 1979 14 p refs
(CTH-Math-1979-11) Avail: NTIS HC A02/MF A01

How the coupling device may be used in the study of the asymptotic behavior of renewal processes in continuous time is shown. It is assumed that the recurrence times have a nonsingular distribution. The key idea is to provide an estimate of the distance, in total variation norm, between the distributions of two translated renewal processes with different delay distributions. Well known results for renewal measures come out as consequences of this estimate. Author (ESA)

N79-32938# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
ON MAXIMUM ERROR AND BOUNDARY CONDITIONS IN CUBIC SPLINE INTERPOLATION AT EQUIDISTANT KNOTS
Ingrid Melinder 1979 33 p refs
(TRITA-NA-79-02) Avail: NTIS HC A03/MF A01

A technique for the accurate approximation in a maximum norm of a continuous function f by splines is presented. Interpolation by cubic splines at equidistant knots, the endpoints, and at the midpoints of the endintervals is suggested. A spline s bar sub 4 is denoted and it is shown that this choice gives almost best knots and nodes by the criterion of Gaffney and Powell. This spline also gives a magnitude of error which is less than a factor of 7 of the least possible maximal error for any cubic spline with these knots. In fact, numerical computations give a factor of 2.7. It is also shown that cubic spline interpolation at equidistant knots is almost one-sided. In this case sharp bounds are given for the first derivative of the error function, provided the exact values are known at the endpoints. The case when the nodes are placed between the knots is investigated. This is in general less accurate. Author (ESA)

N79-32939# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
SOME PROPERTIES OF LINEAR MULTISTEP AND ONE-LEG METHODS FOR ORDINARY DIFFERENTIAL EQUATIONS
Germund Dahlquist 1979 5 p refs Presented at ACM-Signum/Illinois Univ. Meeting on Numerical Ordinary Differential Equations, Urbana-Champaign, Ill., 3-5 Apr. 1979
(TRITA-NA-79-04) Avail: NTIS HC A02/MF A01

The numerical integration of the initial value problem for the differential system dy/dt = f(y) with y an element of a vector space exponent is presented. For the constant stepsize case a one-leg method is written. This is the one-leg twin of the linear multistep method. A one-leg method for the variable stepsize case is also given. Consistency conditions for these methods are discussed. Linear identity for arbitrary stepsize sequences and nonlinear equivalence for geometric stepsize sequences are shown. An exact solution of the differential system is proposed and the local error of the one-leg method discussed. In consideration of the application of the method, stability and contractivity are examined. The geometric idea behind the method is demonstrated in a plane with cartesian coordinates where a one-parameter family of straight lines is defined, the envelope of which is derived. It is shown that this envelope is exactly the parabolic boundary of the domain. Author (ESA)

N79-32940*# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
GENERALIZED DISKS OF CONTRACTIVITY FOR EXPLICIT AND IMPLICIT RUNGE-KUTTA METHODS
Germund Dahlquist and Rolf Jeltsch (Ruhr Univ.) 1979 23 p refs
(NCA2-OR/45-712; Grant SNSF-82.524.077)
(NASA-CR-162125; TRITA-NA-79-06) Avail: NTIS HC A02/MF A01 CSCL 12A

The A-contractivity of Runge-Kutta methods with respect to an inner product norm was investigated thoroughly by Butcher and Burrage (who used the term B-stability). Their theory is extended to contractivity in a region bounded by a circle through the origin. The largest possible circle is calculated for many known explicit Runge-Kutta methods. As a rule it is considerably smaller than the stability region, and in several cases it degenerates to a point. It is shown that an explicit Runge-Kutta method cannot be contractive in any circle of this class if it is more than fourth order accurate. Author (ESA)

N79-32941# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
SOME STABILITY PROPERTIES OF LINEAR MULTISTEP COMPOUND DISCRETIZATIONS OF PARTITIONED DIFFERENTIAL SYSTEMS
Gustaf Soederlind 1979 27 p refs
(TRITA-NA-79-10) Avail: NTIS HC A03/MF A01

A linear multistep compound (LMC) method is obtained when different members of a differential system are integrated by different linear multistep methods, using the same stepsize for the whole system. The stability and contractivity properties of such methods are investigated, assuming that the system satisfies a monotonicity condition with respect to an inner product related to the partitioning of the system. Contractivity is derived for generalized disks contained in the stability regions of the linear multistep methods forming the LMC method. It is shown that, if weakly stable linear multistep methods are excluded, an LMC method is stable for a wide class of problems. Moreover, a properly designed LMC method may be useful for stiff systems with special structure. Author (ESA)

N79-32942# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
COMPUTATIONS RELATED TO G-STABILITY OF LINEAR MULTISTEP METHODS
Randall LeVeque (Stanford Univ., Calif.), Germund Dahlquist, and Dan Andree 1979 25 p refs Sponsored in part by NSF
(Contract EY-76-S-03-0326)
(TRITA-NA-79-11; SU-326-P-30-65) Avail: NTIS HC A02/MF A01

In Dahlquist's proof of the equivalence of A-stability and G-stability, an algorithm was presented for calculating a G-stability matrix for any A-stable linear multistep method. Such matrices, and various quantities computable from them, are useful in many aspects of the stability of a given method. For example, information may be gained as to the shape of the stability region, or the rate of growth of unstable solutions. A summary of the relevant theory and the results of some numerical calculations performed for several backward differentiation, Adams-Bashforth, and Adams-Moulton methods of low order are presented.
Author (ESA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N79-32943 North Texas State Univ., Denton.
THE EVALUATION AND CONTROL OF THE CHANGES IN BASIC STATISTICS ENCOUNTERED IN GROUPED DATA Ph.D. Thesis
James Peter Scott 1979 114 p
Avail: Univ. Microfilms Order No. 7919749

Factors biasing sample statistics when data are summarized in frequency tables were identified. A large scale simulation was employed where 1000 replications of samples of size n = 2 to the (k-1) power for 2 to 12 were drawn from a normal population with a mean of zero and a standard deviation of one. Statistics were computed for the original data and two summarization techniques. No significant bias was found in the mean of the sample means, the standard deviation of the sample means, or the standard deviation of the sample standard deviations. Significant bias ($p > .01$) was found in the mean of the sample standard deviations. The bias resulted from severe range curtailment caused by selection of a finite sample from a population of infinite width and computation of sample standard deviations from frequency tables. It is concluded that use of statistics computed from frequency tables should be avoided. Empirical correction factors are provided to eliminate bias when raw data are unavailable. Dissert. Abstr.

N79-32944 Wisconsin Univ. - Madison.
A BAYESIAN APPROACH TO RANDOM COEFFICIENT MODELS Ph.D. Thesis
Lon-Mu Smiely Liu 1978 210 p
Avail: Univ. Microfilms Order No. 7916562

Linear regression models with coefficients across individual units regarded as random samples from some populations are examined. This type of model is referred to as a random coefficient regression model. The problem is approached from a Bayesian viewpoint. Prior distributions, denoted as L&S priors and as B&T prior, are compared under a simple linear regression model, and it is found that the B&T prior is more sensible than the L&S priors. Posterior distributions of the primary and secondary parameters are discussed. The results are extended to general linear regression models by employing the B&T prior. A pig performance test data is presented. The analysis is extended to time varying regression models. The problem of parameter inference and prediction is analyzed and illustrated by an actual example. Dissert. Abstr.

N79-32945# Wisconsin Univ. - Madison. Mathematics Research Center.
ROBUSTNESS IN THE STRATEGY OF SCIENTIFIC MODEL BUILDING
G. E. P. Box May 1979 40 p refs Presented at the Army Res. Office Workshop on Robustness in Statistics, Res. Triangle Park, N. C., 11-12 Apr. 1978
(Contract DAAG29-75-C-0024)
(AD-A070213; MRC-TSR-1954) Avail: NTIS HC A03/MF A01 CSCL 12/1

The philosophy of robust procedures is discussed. It is argued that the present emphasis by statistical researchers on ad hoc methods of robust estimation is mistaken. Classical methods of estimation should be retained using models which more appropriately represent reality. Attention should not be confined merely to discrepancies arising from outliers and heavy tailed distributions but should be extended to include serial dependence, need for transformation and other problems. Some researches of this kind using Bayes Theorem are discussed. (GRA)

N79-32946# Kentucky Univ., Lexington. Dept. of Mathematics.
COMMENTS ON A SIMPLE PROOF OF THE SEPARATION THEOREM FOR LINEAR STOCHASTIC SYSTEMS WITH TIME DELAYS
Anders Lindquist 1979 6 p ref
(Grant AF-AFOSR-3519-78; AF Proj. 2304)
(AD-A070272; AFOSR-79-0699TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

These comments were provided to illustrate a probable misunderstanding in trying to prove the separation theorem for linear stochastic systems with time delays. The author points outs specific problems and amends the proof to show a better method. GRA

N79-32947# California Univ., Berkeley. Statistical Lab.
SOME MEMORABLE INCIDENTS IN PROBABILISTIC/STATISTICAL STUDIES
Jerzy Neyman 1979 35 p refs
(Contract N00014-75-C-0159; Grant DAAG29-76-G-0167)
(AD-A070023; CU-SL-79-02-ONR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Topics in probabilistic/statistics are briefly reviewed. The Cramer-Hoeffding research incident, two different strategies in mathematical statistics, the Yule-Polya research incident: mechanism of a natural phenomenon, and nonidentifiability, modern recurrences of the Yule-Polya problem, and an optimal competitor to the K.P.'s chi square test are the topics discussed. J.M.S.

N79-32948# Wisconsin Univ. - Madison. Mathematics Research Center.
A COMPARISON OF SAMPLING PLANS FOR BAYESIAN ESTIMATION OF A POISSON PROCESS RATE
Robert L. Wardrop May 1979 19 p refs
(Contract DAAG29-75-C-0024)
(AD-A070215; MFC-TSR-1956) Avail: NTIS HC A02/MF A01 CSCL 12/1

Bayes estimation of the arrival rate of a Poisson process is studied in this paper. For any loss function in the family L sub p, a simple sequential procedure Tau sub p is introduced which, based on the criterion of minimizing expected cost (estimation error plus sampling cost), is either optimal or

asymptotically optimal. The procedure Tau sub p is compared to Type 1 and 2 censoring - the comparison should be useful to experimenters choosing between the three sampling plans.
GRA

N79-32949# Clemson Univ., S.C. Dept. of Mathematical Sciences.
ON SUMS OF GAMMA ORDER STATISTICS WITH APPLICATION TO THE DISTRIBUTION OF R SQUARED IN BEST SUBSET MULTIPLE REGRESSION
K. T. Wallenius and K. Alam Sep. 1978 17 p refs
(Contract N00014-75-C-0451; NR Proj. 042-271)
(AD-A070025; N101; TR-305) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper concerns the distribution of the sum of k largest observations in a sample of m observations from a gamma distribution with n degrees of freedom. The density and cdf of the distribution are given as a sum of gamma density functions. If n is integer valued then the sum consists of a finite number terms. The distribution of the sum arises in a problem of selecting variables in a multiple regression analysis. GRA

N79-32950# Tennessee Univ., Knoxville. Dept. of Psychology.
ESTIMATION OF THE OPERATING CHARACTERISTICS OF ITEM RESPONSE CATEGORIES. 7: BIVARIATE P.D.F. APPROACH WITH NORMAL APPROACH METHOD
Fumiko Samejima 20 Dec. 1978 136 p refs
(Contract N00014-77-C-0360; NR Proj. 150-402; RR0420401)
(AD-A070130; RR-78-6) Avail: NTIS HC A07/MF A01 CSCL 12/1

Bivariate P.D.F. Approach for estimating the operating characteristics of item response categories is introduced, and used in conjunction with the Normal Approach Method, assuming a normal distribution for the conditional distribution of ability, given its maximum likelihood estimate. In this approach, the total set of the maximum likelihood estimates is divided into the item score groups, and for each score group the density function of the maximum likelihood estimate is approximated by a polynomial. It is tried on the same hypothetical data, i.e., the maximum likelihood estimates of ability of the five hundred hypothetical subjects and their responses to the ten binary items following the normal ogive model. Three different degrees of polynomials are used in approximating the density functions of the subsets of the maximum likelihood estimates, and they are called Degree 3, 4 and 5 Cases. The mean square errors are used for evaluating the resultant estimated item characteristic functions, and the two item parameters in the normal ogive model are also estimated. GRA

N79-32951# Wisconsin Univ. - Madison. Mathematics Research Center.
THE CONSTRUCTION OF JACOBI AND PERIODIC JACOBI MATRICES WITH PRESCRIBED SPECTRA
Warren E. Ferguson, Jr. May 1979 40 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS-78-09525)
(AD-A070214; MRC-TSR-1955) Avail: NTIS HC A03/MF A01 CSCL 12/1

The spectral properties of Jacobi and periodic Jacobi matrices are analyzed and algorithms for the construction of Jacobi and periodic Jacobi matrices with prescribed spectra are presented. Numerical evidence demonstrates that these algorithms are of practical utility. These algorithms have been used in studies of the periodic Toda lattice, and might also be used in studies of inverse eigenvalue problems for Sturm-Louiville equations and Hill's equation. GRA

N79-32952# California Univ., San Diego. Dept. of Applied Physics and Information Science.
DISCRETE-TIME SPECTRAL ESTIMATION OF CONTINUOUS-TIME PROCESSES: THE ORTHOGONAL SERIES METHOD SPECTRAL ESTIMATION BY ORTHOGONAL SERIES
Ellias Masry 1 Apr. 1979 18 p refs
(Contract N00014-75-C-0652; NR Proj. 042-289)
(AD-A070641) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let X = (X(t), - infinity < t < infinity) be a stationary time series with spectral density function phi(lambda). Let (t sub n) be a stationary poisson point process on (- infinity, infinity), independent of X. The existence of consistent estimates of phi(lambda) based on the discrete-time observations (X(t sub n)), when the actual sampling instants (t sub n) are not known, has been an open question. Using an orthogonal series method, a class of spectral estimates is considered and its uniform and integratedly uniform consistency in quadratic mean is established. The rates of convergence are determined and compared with those of the kernel-type estimates based on the observations (X(t sub n), t sub N) sub n = 1 to the nth power.
GRA

N79-32953# Orincon Corp., La Jolla, Calif.
PRACTICAL CONTROL ALGORITHMS FOR NONLINEAR STOCHASTIC SYSTEMS AND INVESTIGATIONS OF NONLINEAR FILTERS Annual Technical Report, 1 Feb. 1978 - 31 Jan. 1979
Daniel L. Alspach Mar. 1979 83 p refs
(Contract F44620-75-C-0023; AF Proj. 2304)
(AD-A069980; OC-R-79-0002AA-1; AFOSR-79-0647TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

This annual technical report summarizes a continuation of the investigation into the use of digital nonlinear filters in conjunction with deterministic control algorithms. The problem of stabilization and control of nonlinear stochastic systems observed by noisy measurement data arises in many Air Force systems. Inherent in this problem is the problem of processing noise contaminated measurement data to obtain accurate estimates of the state of the system. If it is possible to estimate the state of the system accurately, then well-known classical deterministic control techniques may often be used to give adequate system performance. This approach will greatly reduce the complexity of the control algorithm over that required by a truly 'optimal' stochastic control policy. On the other hand, the use of recently developed filtering techniques in place of the simpler linearized or extended Kalman filter can greatly increase the accuracy of the state estimates and, thereby, improve system performance and alleviate divergence problems. GRA

N79-32954# Florida State Univ., Tallahassee. Dept. of Statistics.
TESTS FOR DEPENDENCE Interim Report
Myles Hollander Feb. 1979 19 p refs
(Grant AF-AFOSR-3678-78; AF Proj. 2304)
(AD-A069567; FSU-Statistics-M488; TR-78-2; AFOSR-79-0543TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper is designed to provide a sound introduction for a reasonably well-informed reader who is, however, not a specialist in tests for dependence. The paper contains references to many tests but emphasizes the parametric test of independence based on Pearson's sample correlation coefficient r and certain nonparametric tests based on ranks. The ranks tests are generally preferable to the test based on a r in that they have wider applicability, are much less sensitive to outlying observations, are exact under mild assumptions which do not require an underlying bivariate normal population, and have good efficiency power properties. GRA

N79-32955# Clemson Coll., S.C. Dept. of Mathematical Sciences.
A MONTE CARLO COMPARISON OF SOME RIDGE AND OTHER BIASED ESTIMATORS
Amitava Mitra and Robert F. Ling Jan. 1978 36 p refs
(Contract N00014-75-C-0451)
(AD-A069566; N-94; TR-272) Avail: NTIS HC A03/MF A01 CSCL 12/1

A comparative study of the performance of 8 ridge estimators, 5 other biased estimators, and the Ordinary Least Squares estimate is made through a Monte Carlo experiment. The control parameters used in the simulation study are: A measure of the degree of multicollinearity in x, the number of independent variables, the variance of the error term (for unit length parameter vector beta, and the most favorable and the least favorable choices of beta as defined by McDonald and Galarneau). 100 replications are run on each combination of 6 x 3 x 5 x 2 factorial design,

using sample sizes of n = 100. The empirical mean squared error as well as some other properties of the sampling distributions of the squared loss (beta-bar - beta), (beta-bar - beta) are reported for the estimators considered. GRA

N79-32956# Clemson Univ., S.C. Dept. of Mathematics.
ESTIMATION OF THE MEAN OF A NORMAL DISTRIBUTION WITH SINGULAR COVARIANCE MATRIX
Khurshee Alam Nov. 1978 12 p refs
(Contract N00014-75-C-0451)
(AD-A069565; N103; TR-295) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper deals with the problem of estimating the mean of a multivariate normal ditribution with a singular covariance matrix. A class of estimators is given which dominate the maximum likelihood estimator, under a quadratic loss. GRA

N79-32957# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
A STAGEWISE DIRECTIONAL TEST BASED ON T STATISTICS
Sture Holm 1979 12 p refs
(CTH-Math-1979-3) Avail: NTIS HC A02/MF A01

It is shown that in regression analysis with orthogonal design, stagewise multiple tests (or closed multiple tests) of hypotheses concerning different parameters can be completed with directional statements for rejected hypotheses without increasing the probability of false statements. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N79-32958 Princeton Univ., N. J.
SIMULATION OF HIGH DIMENSIONAL SYSTEMS Ph.D. Thesis
Krishnaswamy Nandakumar 1979 163 p
Avail: Univ. Microfilms Order No. 7920413

The problem of devising effective algorithms for performing digital simulation studies is addressed. A class of composite algorithms of the Runge-Kutta type is developed for integrating large systems of coupled ordinary differential equations. Classes of problems which can be studied with such an approach are also identified. A scheme is developed for determining the minimum reflux condition in a multicomponent distillation. The infinite stage column is modelled as a continuous one. This results in significant reduction in the number of equations to be solved. This approach can be used with any vapor-liquid equilibrium model. In addition a short cut method is presented which assumes constant relative volatility and constant heat of vaporization. This is more accurate than the classic Underwood method and yet involves the same amount of computational work. Dissert. Abstr.

N79-32959# Wisconsin Univ. - Madison. Mathematics Research Center.
GLOBAL AND SUPERLINEAR CONVERGENCE OF A CLASS OF VARIABLE METRIC METHODS Summary Report
Klaus Ritter Apr. 1979 47 p refs
(Contract DAAG29-75-C-0024)
(AD-A070204; MRC-TSR-1945) Avail: NTIS HC A03/MF A01 CSCL 12/2

This paper considers a class of variable metric methods for unconstrained minimization. Without requiring exact line searches it is shown that, under appropriate assumptions on the function to be minimized, each algorithm in this class converges globally and superlinearly. GRA

N79-32960# Wisconsin Univ. - Madison. Mathematics Research Center.
LOCAL AND SUPERLINEAR CONVERGENCE OF A CLASS OF VARIABLE METRIC METHODS Summary Report
Klaus Ritter Apr. 1979 19 p refs
(Contract DAAG29-75-C-0024)
(AD-A070208; MRC-TSR-1949) Avail: NTIS HC A02/MF A01 CSCL 12/2

This paper considers a class of variable metric methods for unconstrained minimization problems. It is shown that with a step size of one each member of this class converges locally and superlinearly. GRA

N79-32961# Wisconsin Univ. - Madison. Mathematics Research Center.
ON THE RATE OF SUPERLINEAR CONVERGENCE OF A CLASS OF VARIABLE METRIC METHODS
Klaus Ritter Apr. 1979 21 p refs
(Contract DAAG29-75-C-0024)
(AD-A070209; MRC-TSR-1950) Avail: NTIS HC A02/MF A01 CSCL 12/2

This paper considers a class of variable metric methods for unconstrained minimization. Without requiring exact line searches each algorithm in this class converges globally and superlinearly. Various results on the rate of the superlinear convergence are obtained. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N79-32962 Princeton Univ., N. J.
A SELF-AVOIDING RANDOM WALK Ph.D. Thesis
Gregory Francis Lawler 1979 61 p
Avail: Univ. Microfilms Order No. 7920411

A self avoiding random walk is defined on the integer lattice zeta to the dth power (d > or = to 3) by erasing loops from the transient paths of simple random walk. A Donsker's Theorem is proved for D > or = to 5 by showing that the appropriately scaled down walk approaches the Wiener process in distributions on C to the dth power [0,1]. The process is shown to be asymptotically stationary in five or more dimensions. Techniques of nonstandard analysis, more specifically, internal set theory, are used in the proofs. This limiting behavior is conjectured not to hold for d < or = to 4, because the probability that two independent simple random walk paths have infinitely many intersections is one. A proof of this fact is given to replace the erroneous one in the literature. An upper bound of c n log n is given for the time scale change in four dimensions (as opposed to c n for d > or = to 5). Dissert. Abstr.

N79-32963 Nebraska Univ. - Lincoln.
TORSION THEORIES WITH THE BOUNDED SPLITTING PROPERTY Ph.D. Thesis
Frederick Whitney Call 1979 70 p
Avail: Univ. Microfilms Order No. 7920988

It is shown that any torsion theory with the bounded splitting property (BSP) decomposes uniquely into a direct sum of two types of torsion theories, although the ring itself may not decompose. The first type is analogous to a theory over a torsion ring. The second type is a theory of simple type that corresponds to a theory over a torsion free ring. The ring itself must have strong local properties. The concept of a local ring of primary type is introduced and the discussion is limited to commutative rings with identity. Conditions for the construction of the two types of theories are given. These conditions are in terms of the prime spectrum of the ring and of the localizations at maximal ideals, and are, therefore, intrinsic to the ring. The necessary conditions for piecing together the two types of theories to obtain, a canonical way, every torsion theory with BSP, are derived. Dissert. Abstr.

N79-32964 Houston Univ., Tex.
SEMICLOSED OPERATORS IN HILBERT SPACE Ph.D. Thesis
William Eugene Kaufman 1979 53 p
Avail: Univ. Microfilms Order No. 7920648

A linear operator C, in a Hilbert space H, is semiclosed provided there is a continuous linear operator B, from H onto the domain of C, such that CB is continuous. The family delta rho(H) of all such operators contains all sums of its members, and is the smallest family which contains every closed linear operator in H and all products of its members. It is proved that each member of delta rho(H) is the sum of two closed one to

one linear operators in H having common domain and closed ranges, which allows the expression of any arithmetical combination of closed operators as such a sum. It is shown that each member of delta rho(H) is the strong limit on its domain of a sequence of continuous linear operators on H. This shows that delta rho(H) is the smallest strongly sequentially closed family containing every continuous linear operator from H into H.
Dissert. Abstr.

N79-32965 New York Univ., N. Y.
QUALITATIVE ANALYSIS OF THE PERIODICALLY FORCED RELAXATION OSCILLATIONS Ph.D. Thesis
Mark Levi 1978 267 p
Avail: Univ. Microfilms Order No. 7918976

A qualitative analysis of the periodically forced relaxation oscillations is described. An equation for the system of the Van der Pol type is given. A simple geometrical representation of the equation is derived. The representation is applied to study the limit behavior of the equation. An analysis of the qualitative behavior of the equation is obtained by combining the representation with the use of symbolic dynamics. Dissert. Abstr.

N79-32966# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
ALGEBRAIC SYSTEMS: APPLICATIONS IN THE BEHAVIORAL AND SOCIAL SCIENCES
Stephen Hirshfeld and William M. Bart Feb. 1978 122 p refs
(AD-A070103; ARI-TR-78-P6) Avail: NTIS HC A06/MF A01 CSCL 12/11

This publication is an introduction to the uses of algebraic systems in the behavioral and social sciences. Algebra has already manifested its utility in the physical sciences. In this book, a variety of uses of algebra in the behavioral and social sciences is provided along with descriptions of several algebraic systems. This volume is intended to be sourcebook for theoretical conceptualizations for professionals in the behavioral and social sciences. This publication with its emphasis on description, application, and utility should be a valuable aid to the behavioral and social science researcher. GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N79-32967 Virginia Polytechnic Inst. and State Univ., Blacksburg.
PARAMETRICALLY EXCITED NONLINEAR MULTIDEGREE-OF-FREEDOM SYSTEMS Ph.D. Thesis
Edward George Tezak 1979 166 p
Avail: Univ. Microfilms Order No. 7921033

Parametrically excited nonlinear multidegree of freedom systems are analyzed. The nonlinearity considered is cubic and small so that the system of equations is weakly nonlinear. Modal damping is included and the parametric excitation is harmonic. The systems examined include those with distinct natural frequencies as well as those with a single repeated frequency. The significant role played by the existence of an internal resonance is explored in depth. The derivative expansion version of the method of multiple scales, a perturbation technique, is used to develop solvability conditions for the various combinations of internal and parametric resonances considered. Regions where trivial and nontrivial solutions exist are defined and the stability of the solutions within each region is discussed. Nontrivial, unstable solutions were shown to exist in regions where nontrivial stable solutions are known. Dissert. Abstr.

N79-32968# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
SYNCHRONIZATION OF CLOCKS IN THE 100 ps RANGE M.S. Thesis - Paris Univ.
Jean-Patrick Moreau 1978 173 p refs In FRENCH; ENGLISH summary Translation is in process as ESA-TT-578
(ONERA-NT-1978-1) Avail: NTIS HC A08/MF A01

A method for measuring, with high resolution (100 ps), the differences between two distant atomic clocks is presented. After an analysis of the elementary actions making up a synchronization operation, the main characteristics of the set of measuring units are determined. The principle of the system proposed is described as the transfer of the time information by optical channel, using a semiconductor laser. The various of the chain (time scales, transducers, telescopes, chronometers), are then described and calculated. The results of two experiments are presented; one concerns the synchronization of clocks 6 km apart, the other that of the time keepers of the Paris, France, and San-Fernando, Spain observatories. It is concluded that the synchronization method by laser beam, as described, makes it possible to reach the expected accuracy of 100 ps when the clocks are in line of sight of each other, and is better than 1 ns when they are separated by several hundred kilometers making it necessary to use an airborne transfer clock. Author (ESA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N79-32969# Man-Acoustics and Noise, Inc., Seattle, Wash.
COMMERCIAL AIRCRAFT FLIGHT DECK NOISE CRITERIA Final Report
J. E. Mabry, B. M. Sullivan, and R. A. Shields Jan. 1979 71 p refs
(Contract DOT-FA77WAI-723)
(AD-A072029; FAA-RD-79-66; MAN-1037) Avail: NTIS HC A04/MF A01 CSCL 20/1

As a method for obtaining results that could contribute to the establishment of commercial jet aircraft flight deck noise criteria, fifty persons were exposed to simulations of various flight deck noise exposure conditions. Exposure levels investigated were 75, 80 and 85 dBA for periods of 1, 2, and 4 hours. Noise spectra representing both older narrow-body and newer technology wide-body jet aircraft were utilized. Response measures emphasized were temporary threshold shift (TTS) and speech intelligibility, but annoyance ratings to the exposure conditions were also obtained. Author

N79-32970# Texas Univ. at Austin. Applied Research Labs.
EXPERIMENTAL SUPERPOSITION OF ACOUSTIC FIELDS FOR DETECTION PERFORMANCE STUDIES
Jack A. Shooter and Milton L. Gentry, Jr. 15 Mar. 1979 34 p refs
(Contract N00039-78-C-0307)
(AD-A070963; ARL-TM-79-3) Avail: NTIS HC A03/MF A01 CSCL 17/1

The concept of superimposing a target acoustic field onto an independent noise acoustic field is discussed and sample results are presented using data from the deep Atlantic Ocean. The purpose is to explore the principles and methods of how this concept can be implemented for assessing signal detection in the presence of noise as applied to particular systems. The target signal was composed of high and low level components which were used simultaneously. From these data, the high level signal was scaled down in amplitude and reinserted into the noise spectrum. The detection results of the actual low level signal and the reconstructed low level signal are compared and the results are shown to be essentially the same. GRA

N79-32971# Naval Surface Weapons Center, Dahlgren, Va.
EDDY CURRENT TESTING AND ULTRASONIC REFERENCE STANDARDS FOR DEPLETED URANIUM BARSTOCK Final Report
C. W. Anderson Mar. 1979 27 p refs
(AD-A070295; NSWC/DL-TR-79-86) Avail: NTIS HC A03/MF A01 CSCL 18/7

The design and testing of ultrasonic test standards for one-half inch 12.7mm diameter depleted uranium barstock is discussed. This report also explores the feasibility of testing the barstock for near surface flaws using an eddy current technique. It is shown that eddy current testing is the most efficient means available for detecting surface and near surface flaws in the barstock material. GRA

N79-32972# Naval Research Lab., Washington, D. C.
A FILLED SILICONE RUBBER MATERIALS SYSTEM WITH SELECTABLE ACOUSTIC PROPERTIES FOR MOLDING AND COATING APPLICATIONS AT ULTRASONIC FREQUENCIES Interim Report
R. D. Corsaro and J. D. Klunder 11 May 1979 35 p refs
(AD-A070461; NRL-8301) Avail: NTIS HC A03/MF A01 CSCL 20/1

This paper describes a convenient system of materials that can be used to prepare molded articles or spray-deposited thin coatings of materials with well-defined and continuously variable bulk acoustic properties. The system consists of four components. First, RTV-602 (with catalyst) is used as the rubber base; it is convenient to work with, has a low longitudinal absorption, and does not readily support shear waves. Second, typically one of four microballoon types is added, usually in the quantity necessary to obtain the desired attenuation coefficient. Third, an appropriate amount of ferric oxide is added to achieve the required impedance match, sound speed, or density. Finally, toluene is used to dilute the mix to a usable viscosity; we have found that toluene can be added in even large quantities and later removed, either before or after curing, without altering the final properties of the resulting rubber. Equations are presented which allow the reliable prediction of longitudinal wave speed, attenuation, impedance, and density over the useful range of composition variation. These equations were constructed using acoustical measurements at frequencies from 2.5 to 7 MHz, and from direct (immersion) density determinations. Echo-reduction measurements on flat plates have been used to verify that the spray deposition technique described here does not significantly alter the acoustical properties of these composite mixtures. GRA

N79-32973# Texas Univ. at Austin. Applied Research Labs.
A SUMMARY OF THE RESULTS OF A STUDY OF ACOUSTIC INTERACTION WITH THE SEA FLOOR Annual Report, 1 Jan. - 31 Dec. 1978
Kenneth E. Hawker and Steven R. Rutherford 5 Mar. 1979 78 p refs
(Contract N00014-78-C-0113)
(AD-A070954; ARL-TR-79-2) Avail: NTIS HC A05/MF A01 CSCL 20/1

This report summarizes the results of research carried out during 1978 on acoustics interaction with the sea floor. Major topics considered are propagation in a range variable environment by mode-mode coupling methods, bottom roughness (scattering) studies, and a number of sensitivity studies including the acoustical effects of sediment rigidity, Doppler broadening due to source motion, and the relationship between mode attenuation and bottom loss per bounce. GRA

N79-32974# Polytechnic Inst. of New York, Brooklyn. Dept. of Mechanical and Aerospace Engineering.
SOME NONLINEAR PROBLEMS IN TRANSONIC HELICOPTER ACOUSTICS Final Report
Morris P. Isom May 1979 64 p refs
(Grant DAAG29-76-G-0035)
(AD-A069564; POLY-M/AE-79-19; ARO-12937.1-E) Avail: NTIS HC A04/MF A01 CSCL 20/1

The nonlinear potential equation that determines the near aerodynamic and far acoustic fields of a hovering transonic helicopter blade is derived. Properties of this equation provide a qualitative description of characteristic surfaces associated with the nonlinear flow field. A simple linearized acoustic formula is developed; a nonlinearization scheme is then applied to this formula, and the linear and nonlinear acoustic pressure profiles, including propagating acoustic shock waves, are numerically determined and compared with experimental data. A tentative conclusion is that the radiated sound field should become measurably different when the blade tip first punctures the sonic surface associated with the rotor differential equation. This conjecture is suggested by the mathematical properties of the rotor equation and recent experimental work. GRA

N79-32975# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
APPLICATIONS OF THE MODULATION TRANSFER FUNCTION IN ROOM ACOUSTICS
T. Houtgast and H. J. M. Steeneken 1978 32 p
(IZF-1978-19; TDCK-71457) Avail: NTIS HC A03/MF A01

The modulation transfer function (MTF) quantifies the limitations of an auditorium in transmitting speech from the speaker's position to a listener. The way in which any given MTF can be converted into an index (Speech Transmission Index) which correlates well with the mean intelligibility score obtained with speakers and listeners is described. The question of how to calculate the (expected) MTF from the general specifications of an auditorium available in the design stage is then examined. This technique may be applied as a tool in auditorium design. Finally, the way in which the MTF can be measured in actual conditions which provides a direct reading in terms of speech intelligibility is shown. Author (ESA)

N79-32976# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
COMPARISON OF SOME METHODS FOR MEASURING SPEECH LEVELS
H. J. M. Steeneken and T. Houtgast 1978 19 p refs
(IZF-1978-22; TDCK-71655) Avail: NTIS HC A02/MF A01

Some methods for measuring speech levels were compared as test material running speech as well as embedded test words were used. On the basis of the measurement results a selection was made between preferred and other methods, with respect to application of a threshold (to ignore silent periods), reproducibility, band pass limiting, and the relation to intelligibility. Results show that methods based on peak readings are independent of silent periods. Methods in which the envelope is sampled also offer an obvious seperation between silent periods and speech periods. Methods in which A-filtered speech signals are used show a closer relation with intelligibility than methods without any bandpass filtering. In general, for all measurements, reproducibility and absolute accuracy fall within one dB, with the exception of peak-reading methods. Here, variable dynamic behavior among instruments lead to results with a considerable spread. Author (ESA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N79-32977 Cincinnati Univ., Ohio.
AUTOMATED GEOMETRY OPTIMIZATION FOR GROUND STATES OF MOLECULES Ph.D. Thesis
Naohiro Kondo 1978 109 p
Avail: Univ. Microfilms Order No. 7919336

A completely automated computational method was developed for optimization of the ground state geometries of molecules using the CNDO/2 approximation. To make these calculations more efficient, the symmetry coordinates, the analytical gradient, and a quadratic acceleration technique were used. This optimization method was tested using a series of small molecules. It was verified that the optimization method converged to a true minimum by showing that the same converged structure is obtained independent of the starting geometry. The optimizations of the geometry of phenyl cation and related molecules led to rather unusual but chemically meaningful results. Biphenyl and related bicyclic molecules were studied. As a result of the entire set of test calculations, it is indicated that this geometry optimization method can predict a chemically reasonable structure for even a large molecule or molecular system within a reasonable computational time. Dissert. Abstr.

N79-32978 Texas Univ. at Austin.
LATERAL DIFFUSION IN MODEL MEMBRANES BY PULSED NUCLEAR MAGNETIC RESONANCE Ph.D. Thesis
An-Li Kuo 1979 211 p
Avail: Univ. Microfilms Order No. 7920149

Fourier transformation pulsed gradient spin echo nuclear magnetic resonance was used to investigate the molecular dynamics of liquid crystal systems. Soaps and lipids, when mixed with water at appropriate concentrations, form well ordered multilayers, a lamellar phase. Soap/water and lipid/water

multilayers were studied because of their structural dynamic similarities to biological membranes. Self diffusion coefficients of these systems were measured directly using pulsed gradient nuclear magnetic resonance at 30 MHz. The temperature and hydration dependence of lipid lateral diffusion in model membrane/water multilayers of potassium oleate L alpha dipalmitoyl, L alpha-dimyristoyl, L alpha-dilauroyl, and egg yolk phosphatidyl cholines were determined. Macroscopic oriented samples were used to minimize anisotropic dipolar interactions and permit formation of a spin echo. Dissert. Abstr.

N79-32979 Houston Univ., Tex.
FOURIER TRANSFORM NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY APPLICATIONS OF CHEMICAL INTEREST Ph.D. Thesis
Ruth R. Inners 1979 340 p
Avail: Univ. Microfilms Order No. 7920647

Experiments designed to acquire chemical shifts, scalar coupling, dipolar coupling, and quadrupolar coupling, as well as spin-lattice relaxation, spin-spin relaxation, and nuclear Overhauser enhancement are outlined. The computer programs LAOCOON 3, MARIP, and NUMARIT, used in analysis of spectra obtained in isotropic media, and LEQUOR and LAOCOONOR, used in analysis of spectra obtained in anisotropic media, are discussed. Several examples for equating coupling constants and chemical shifts to descriptions of molecular geometry are used. Applications presented include: (1) analysis of a tetrapeptide and the deduced conformational information; (2) deductions of configurations of four diastereomers using lanthanide shift reagents; (3) analysis of cyclobutanone using LAOCOON 3 and MARIP; and (4) analysis of the relationship between nmr parameters and the dihedral angle at the central ring of an asymmetric pyridine.
Dissert. Abstr.

N79-32980 Rice Univ., Houston, Tex.
SHOCK TUBE STUDIES OF REACTION AND ENERGY TRANSFER RATES BETWEEN MOLECULES AND REACTIVE ATOMS Ph.D. Thesis
Richard Byron Quy 1979 133 p
Avail: Univ. Microfilms Order No. 7919623

An unconventional shock tube was constructed to study the interaction of reactive atoms with small gas molecules at temperatures ranging from 1000 to 3500 K and at pressures of less than one atmosphere. The experimental section of the shock tube was designed to be part of a discharge flow system in which H2 and O2 were partially dissociated by an RF discharge to form gas mixtures containing a few percent of reactive atoms. Three atom-molecule interaction rates were studied: (1) vibrational relaxation of O2 in the presence of atomic oxygen; (2) reaction of H with N2O; and (3) reaction of H with CO2. The vibrational relaxation rate of O2 dilute in Ar and in O2 and the thermal decomposition rate of N2O were also measured. Dissert. Abstr.

N79-32981 Princeton Univ., N. J.
THE VON WEIZSAECKER AND EXCHANGE CORRECTIONS IN THE THOMAS FERMI THEORY Ph.D. Thesis
Rafael Donoso Benguria 1979 85 p
Avail: Univ. Microfilms Order No. 7920431

Two corrections to the Thomas-Fermi theory of atoms are studied. First, the correction for exchange, that is the effect of the Pauli principle in the interaction energy, is considered. A second correction, due to von Weizsaecker, is also discussed. This is an inhomogeneous correction to the kinetic energy density of the form c sub W (inverted Delta square root Rho) to the 2d power which was introduced to obtain the correct behavior of the electron density Rho far away and very close to the nuclei. Dissert. Abstr.

N79-32982 Rice Univ., Houston, Tex.
THE FORMATION OF REACTIVE INTERMEDIATES IN RARE-GAS MATRICES AND A STUDY OF THE INTERACTIONS INVOLVED IN PROTON RARE-GAS CLUSTERS Ph.D. Thesis
Paul Frederick Meier 1979 215 p
Avail: Univ. Microfilms Order No. 7919611

The first half of this dissertation studies reactive intermediates which were formed in rare-gas matrices using epr matrix isolation spectroscopy. In particular, the reactions of lithium with small molecules were studied at liquid helium temperatures in argon matrices. The second half of this dissertation involves theoretical studies of the interactions between a proton and rare-gases. The total interaction energy between a proton and one or two helium atoms is resolved into electrostatic, polarization, and charge-transfer energy components. A general model is described for determining the long-range interaction energies in proton rare-gas clusters by separately calculating the individual components. Dissert. Abstr.

N79-32983# Naval Postgraduate School, Monterey, Calif.
INELASTIC ELECTRON SCATTERING FROM Li-7 IN THE VICINITY OF THE ALPHA-TRITON THRESHOLD M.S. Thesis
Robert Francis Ryan Mar. 1979 63 p refs
(AD-A071072) Avail: NTIS HC A04/MF A01 CSCL 20/8

Inelastic electron scattering experiments were carried out on Li-7 within a range of momentum transfer squared of .2 is less than sq q is less than .65(1/sq F). Inelastic cross section and form factors were determined for the 4.55 MeV inelastic peak and the inelastic continuum caused by the disintegration of Li-7 into an alpha particle and a triton above the threshold of 2.45 MeV. GRA

N79-32984# Chicago Univ., Ill. Dept. of Chemistry.
INTERNAL ENERGY TRANSFER IN ISOLATED MOLECULES: ERGODIC AND NONERGODIC BEHAVIOR Interim Report
Stuart A. Rice 1978 45 p refs
(Contract F49620-76-C-0017; AF Proj. 2303)
(AD-A071021; AFOSR-79-0797TR) Avail: NTIS HC A03/MF A01 CSCL 20/10

This paper addresses the following questions: (1) Under what conditions, if any, is intramolecular energy exchange slow/rapid relative to other processes, for example photon emission, or isomerization, or fragmentation? (2) How does the intramolecular energy exchange depend on the energy of the molecule and the nature of the initial excitation? (3) If there are situations for which intramolecular energy exchange is slow relative to chemical reaction, why does this behavior occur? Does it derive from special characteristics of the molecular force fields? Are there dynamical or symmetry restrictions on the spectrum of states in these cases? Are these special situations commonly or rarely found? (4) Given the answers to (3), can we devise excitation methods and reaction conditions that permit enchancement of the selectivity of the chemistry that follows? GRA

N79-32985# IRT Corp., San Diego, Calif.
INVESTIGATION OF ELECTRON ATTACHMENT IN POLYATOMIC MOLECULES Annual Technical Progress Report, 1 Apr. 1978 - 31 Mar. 1979
Jerry T. Dowell 31 May 1979 10 p
(Contract F49620-77-C-0071; AF Proj. 2303)
(AD-A070069; IRT-8164-003; AFOSR-79-0726TR) Avail: NTIS HC A02/MF A01 CSCL 20/8

Electron attachment in sulfur hexafluoride, tungsten oxide vapor, and molybdenum hexafluoride was studied using molecular beams crossed with an electron beam of high energy resolution. Results in sulfur hexafluoride were in agreement with previous work. Attachment in tungsten oxide was found to be to the trimer, yielding the monomer negative ion. GRA

N79-32986# Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
INELASTIC ELECTRONIC COLLISION IN HYDROCARBONS AND DYES Technical Report, 1 Dec. 1972 - 30 Nov. 1978
Dec. 1978 41 p refs
(Grants DA-ARO(D)-31-124-73-G66; DAAG29-76-G-0101)
(AD-A070172; ARO-11041.13-P; ARO-13469.4-P) Avail: NTIS HC A03/MF A01 CSCL 20/8

This final ARO report summarizes our results on electron collision with atmospheric gases and hydrocarbon molecules. Absolute cross sections for vibrational excitation, dissociative attachment and associative detachment were determined in 0-20 eV. The magnitudes and behavior of these processes were predominated by resonances. Recently we also developed two methods for studying inelastic cross sections at near thermal energies and negative ion formation from excited molecules.

Perspectives of our past research and our outlook toward the future are presented. Author (GRA)

N79-32987# California Univ., Berkeley. Lawrence Berkeley Lab.
VIBRATIONAL ENERGY TRANSFER IN SELECTIVELY EXCITED DIATOMIC MOLECULES Ph.D. Thesis
C. J. Dasch Sep. 1978 257 p refs
(Contract W-7405-eng-48)
(LBL-8208) Avail: NTIS HC A12/MF A01

Single rovibrational states of HCl(v=2), HBr(v=2), DCl(v=2), and CO(v=2) were excited with a pulsed optical parametric oscillator (OPO). Total vibrational relaxation rates near resonance quenchers were measured at 295 K using time resolved infrared fluorescence. These rates are attributed primarily to V - V energy transfer, and they generally conform to a simple energy gap law. A small deviation was found for the CO(v) + DCl(v prime) relaxation rates. Upper limits for the self relaxation by V - R,T of HCl(v=2) and HBr(v=2) and for the two quantum exchange between HCl and HBr were determined. The HF dimer was detected at 295 K and 30 torr HF pressure with an optoacoustic spectrometer using the OPO. These V - V exchange rates appear to behave as a first order perturbation in the vibrational coordinates. The coupled rotation-vibrational dynamics were investigated theoretically. Large delta J transitions appear to be important, but these calculations differ by orders of magnitude on specific rovibrational transition rates. DOE

N79-32988# Los Alamos Scientific Lab., N. Mex.
COUPLED NEUTRON AND PHOTON CROSS SECTIONS FOR TRANSPORT CALCULATIONS
R. J. Barrett and R. E. MacFarlane Apr. 1979 15 p refs
(Contract W-7405-eng-36)
(LA-7808-MS) Avail: NTIS HC A02/MF A01

A compact set of multigroup cross sections and transfer tables for use in neutron and photon transport calculations was prepared from ENDF/B-IV using the NJOY processing system. The library includes prompt and steady-state coupled sets for neutrons and photons in FIDO format, prompt and steady-state fission spectra (chi vectors) for the fissionable isotopes, and a table of useful response functions including heating and gas production. These multigroup constants should be useful for a wide variety of problems where self-shielding is not important. DOE

N79-32989# Los Alamos Scientific Lab., N. Mex.
MESON FACTORIES
J. F. Dicello, M. Zaider, and J. N. Bradbury 1979 5 p refs Presented at the 6th Intern. Congr. of Radiation Res., Tokyo, 14-18 May 1979
(Contract W-7405-eng-36)
(LA-UR-79-1236; Conf-790524-4) Avail: NTIS HC A02/MF A01

Technological improvements in accelerator design resulted in the capability to develop medium energy proton accelerators with beam intensities of almost 1 mA. These beams are able to produce fluxes of secondary particles, including pions, muons, neutrinos, and neutrons, which are as much as 10,000 times as intense as those previously available. The machines built for optimum meson production are called meson factories. The characteristics of these facilities are reviewed, and the present programs in applied research, and some potential areas of future work are discussed. DOE

N79-32990# Sandia Labs., Albuquerque, N. Mex.
APPLICATION OF ION CHANNELING TO RADIATION DAMAGE STUDIES
S. T. Picraux 1979 9 p refs
(Contract EY-76-C-04-0789; DE-AC04-76-DP00789)
(SAND-79-0497C) Avail: NTIS HC A02/MF A01

The ion channeling technique is presented as it applies to the study of radiation damage. Emphasis is given to recent advances which allow quantitative depth profiling studies of intrinsic defects in metals. DOE

N79-32991# Los Alamos Scientific Lab., N. Mex.
STABILITY OF THE LANTHANIDE HYDRIDES
D. H. W. Carstens Feb. 1979 9 p refs
(Contract W-7405-eng-36)
(LA-7602-MS) Avail: NTIS HC A02/MF A01

A review of the unclassified literature is presented that tabulates the reported equilibrium pressure data of the lanthanide diprotides and dideuterides in the form log P(torr) = A/T + B. Values of the thermodynamic properties are tabulated and the trend in those data is explained by several semiempirical formulas. The isotope shifts are calculated by two independent means. For any lanthanide metal, the heat of formation of the dihydride is about 1.5 kcal/mole more negative than the dideuteride, which, in turn, is about 0.5 kcal/mole more negative than the ditritide. These values agree well with the experimental values. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N79-32992 Texas A&M Univ., College Station.
POLARIZATION TRANSFER IN INELASTIC PROTON SCATTERING Ph.D. Thesis
Wayne Douglas Cornelius 1979 140 p
Avail: Univ. Microfilms Order No. 7919058

A polarimeter technique allowing unrestricted examination of polarization transfer in inelastic proton scattering is presented. The polarimeter system is used to measure polarization transfer in a number of reactions in light nuclei. The data are compared to properly antisymmetrized distorted wave calculations which use realistic nucleon-nucleon effective interactions. Due to ambiguities surrounding interpretation of polarization transfer data, the connection between polarization transfer and spin-flip probability is drawn. The interpretation of spin-flip probability is easily extended to cover situations where gross discrepancies between the data and the calculations were observed. Spin-flip probability is shown to be a simple quantity which is determined primarily by the spin transfer in a reaction. The spin-flip probability characteristic of specific angular momentum transfer is derived. Dissert. Abstr.

N79-32993 Notre Dame Univ., Ind.
SYMMETRY BREAKING IN NUCLEI Ph.D. Thesis
Ali Mohamed Awin 1979 106 p
Avail: Univ. Microfilms Order No. 7919935

Features of the breaking of symmetries involving isospin and parity in nuclei are studied. The manner in which isobaric multiplet decay widths are modified by electromagnetic interactions is studied. Arguments based on lowest order perturbation theory are given that the widths should be quadratic in T sub z if the multiplet is particle unstable in the absence of electromagnetism, but quartic for stable multiplets. The total widths of experimentally known multiplets are analyzed to determine their algebraic T sub z dependence and both quadratic and nonquadratic cases are found. A model of the Coulomb energy is used to determine the masses of these multiplets in the absence of electromagnetism as well as the masses of the lowest T allowed decay channels. It is found that the association of quadratic widths with unstable multiplets and nonquadratic widths with stable ones is borne out in some of the experimentally known cases while inconclusive in others. Dissert. Abstr.

N79-32994# Fermi National Accelerator Lab., Batavia, Ill.
MODULAR CALORIMETER SYSTEM FOR USE IN HIGH ENERGY PHYSICS
B. T. Yost, M. D. Corcoran, L. Cormell, C. Cortez, M. A. Dris, A. R. Erwin, P. J. Gollon, E. H. Harvey, A. Kanofsky, W. Kononenko et al Oct. 1978 9 p refs Presented at IEEE Nucl. Sci. Symp., Washington, D. C., 18 Oct. 1978 Prepared in cooperation with Lehigh Univ.; Pennsylvania Univ., Philadelphia; and Wisconsin Univ. - Milwaukee
(Contract EY-76-C-02-3071)
(COO-3071-239; Conf-781033-45) Avail: NTIS HC A02/MF A01

A modular hadron calorimeter was designed and built for

the study of high energy particle interactions which produce particles of high transverse momentum. The energy resolution of this system and the triggering method for selecting the interactions of interest are described. DOE

N79-32995# Battelle Pacific Northwest Labs., Richland, Wash.
SUMMARY OF NATIONAL AND INTERNATIONAL RADIOACTIVE WASTE MANAGEMENT PROGRAMS
K. M. Harmon Mar. 1979 94 p
(Contract EY-76-C-06-1830)
(PNL-2941) Avail: NTIS HC A05/MF A01

The status of fuel cycle and waste management programs is described for Argentina, Australia, Austria, Belgium, Brazil, Canada, China, Denmark, Finland, France, Democratic Republic of Germany, Federal Republic of Germany, India, Iran, Italy, Japan, Mexico, the Netherlands, Pakistan, Spain, Sweden, Switzerland, United Kingdom, United States, and USSR. This compilation attempts to provide current information as of the end of January 1979. DOE

N79-32996# Los Alamos Scientific Lab., N. Mex.
NUCLEAR SAFEGUARDS RESEARCH AND DEVELOPMENT Program Status Report, May - Aug. 1978
S. D. Gardner 1978 105 p refs
(Contract W-7405-eng-36)
(LA-7616-PR) Avail: NTIS HC A02/MF A01

The status of the Nuclear Safeguards Research and Development program pursued by LASL Safeguards Groups Q-1, Q-2, Q-3, and Q-4 is presented. Topics covered include nondestructive assay technology development and applications, international safeguards, perimeter safeguards and surveillance, concepts and subsystems development (e.g., DYMAC program), integrated safeguards systems, training courses, and technology transfer. Salient features of the program and technical progress during the current reporting period are outlined. DOE

N79-32997# Department of Energy, Las Vegas, Nev. Nevada Operations Office.
NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS Project Plan, Fiscal Year 1979
Mar. 1979 111 p ref
(NVO-196-9) Avail: NTIS HC A06/MF A01

The management plan and cost for the disposal of high-level wastes at Nevada test site is presented. The overall project, management structure, technical approach, and work breakdown structure are described. Topics cover the history of the project and a potential future course of action, FY 1979 project work, delegated responsibilities of all project management functions, critical questions that guide the technical approach, and subtask work plans which outline the work in detail for this fiscal year. DOE

N79-32998# Los Alamos Scientific Lab., N. Mex.
EARLY SCREENING OF NUCLEAR WASTE RETRIEVAL AND PROCESSING ALTERNATIVES
W. J. Whitty and N. D. Cox (Idaho Nat. Eng. Lab., Idaho Falls) 1979 22 p Presented at the Joint Natl. Meeting of the Inst. of Management Sci. and the Operations Res. Soc. of Am., New Orleans, 30 Apr. 1979
(Contract EY-76-C-07-1570)
(LA-UR-78-2412; Conf-790455-1) Avail: NTIS HC A02/MF A01

The retrieval and processing of the buried transuranic-contaminated waste stored at the Idaho National Engineering Laboratory was studied by two task force teams. A linear additive scoring model was used for the evaluation. The figures of merit for the retrieval systems showed that one of the systems was superior to the others. DOE

N79-32999# Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
LONG-TERM STORAGE OF IRRADIATED CANDU FUEL UNDER WATER
J. F. Walker Jan. 1979 24 p refs
(AECL-6313) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The various factors influencing the long-term integrity of stored fuel are considered. Zirconium-alloy-clad uranium dioxide fuel and evidence from Canada and elsewhere is considered. Under storage conditions, changes take place so slowly, if at all, that no evidence has been obtained that indicates any deterioration of stored fuel after 10 to 15 years under water. All the information now available indicates that irradiated CANDU fuel may be safely stored by the present methods as long as it is technically and economically desirable to do so. Stored fuel should continue to be examined after increasingly long storage times under water to confirm the stability of the Zircaloy cladding containing the fuel pellets. DOE

N79-33000# Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
MANAGEMENT OF RADIOACTIVE FUEL WASTES: THE CANADIAN DISPOSAL PROGRAM
J. Boulton, ed. Oct. 1978 143 p refs
(AECL-6314) Avail: NTIS (US Sales Only) HC A07/MF A01; DOE Depository Libraries

The research and development program to verify and demonstrate the concepts for the safe, permanent disposal of radioactive fuel wastes from Canadian nuclear reactors is presented. The program is concentrating on deep underground disposal in hardrock formations. The nature of the radioactive wastes is described, and the options for storing, processing, packaging and disposing of them are outlined. The program to verify the proposed concept, select a suitable site and to build and operate a demonstration facility is described. DOE

N79-33001# Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
RISK ASSESSMENT FOR RADIOACTIVE WASTE DISPOSAL
R. B. Lyon Jan. 1979 21 p refs
(AECL-6322) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The objectives of risk assessment studies for radioactive waste disposal are: to specify the features that prevent the escape of radionuclides from a deep disposal vault, to estimate how effective these features are likely to be, and to determine the potential consequences of the expected situation and conceivable but unlikely situations. The major features to be analyzed include the insoluble nature of the waste form itself, the resistance of its container to corrosion or mechanical damage, the effectiveness of the massive rock barrier and the hold-up and dilution of radionuclides in the surface environment. Computer modelling is used in a technique called pathway analysis to bring together the experimental data, field data and understanding of the relevant phenomena into an assessment of the resultant effect on man and the environment. DOE

N79-33002# California Univ., Livermore. Lawrence Livermore Lab.
PROPERTIES OF MULTISTEP AMPLITUDES IN CHARGE-EXCHANGE REACTIONS
V. A. Madsen and V. R. Brown Mar. 1979 19 p refs Presented at Conf. on the p,n Reaction and the Nucleon-Nucleon Force, Telluride, Colo., 29 Mar. 1979
(Contract W-7405-eng-48)
(UCRL-82665; Conf-790348) Avail: NTIS HC A02/MF A01

A historical review is given on what is known about inelastic multistep processes in analog charge exchange transitions at lower energies in the few tens of MeV, particularly the possibility of measuring directly with the (p,n) reaction the isovector deformation parameter. Then the expected energy dependence of multistep relative to one step processes is shown, and an attempt is made to explain the behavior. The proton reactions on Mo(-92)(-100) showing the analog ratio and the differential cross sections at 26 MeV and a listing of the energy dependence of the analog and analog cross sections and the two step mechanism for analog excitation are presented. DOE

N79-33003# California Univ., Berkeley. Lawrence Berkeley Lab.
ELECTRONS AND KAONS IN CHARMED PARTICLE DECAYS Ph.D. Thesis
Joseph Michael Feller May 1979 145 p refs
(Contract W-7405-eng-48)
(LBL-9017) Avail: NTIS HC A07/MF A01

The electron content, kaon content, and associated electron-kaon content of the decays of D mesons and other charmed particles produced in electron-positron annihilation are presented. At the psi(3772) resonance the following inclusive branching ratios for D meson decays to charged kaons were measured. At the psi(3772) resonance the average semileptonic branching ratio for D(0) and D(+) decays to electrons was measured to be .076 + or - .028. The average semileptonic branching ratio of charmed particles produced in e(+)e(-) annihilation at center of mass energies from 3.9 to 7.4 GeV is found to be equal within errors to that of the D's. At all energies the electron momentum spectra are consistent with a combination of the decays D yields Ke nu and D yields K*E nu. DOE

N79-33004# California Univ., Livermore. Lawrence Livermore Lab.
DEFINITION AND CONCEPTUAL DESIGN OF A SMALL FUSION REACTOR
Apr. 1979 263 p refs Sponsored in part by Elec. Power Res. Inst.
(Contract W-7405-eng-48; EPRI Proj. 922)
(EPRI-ER-1045) Avail: NTIS HC A12/MF A01

Various mirror fusion reactor concepts that might result in small systems for the effective production of electrical power or stored energy (e.g., nuclear and chemical fuels) were examined. The conceptual design of a pilot plant that could provide a useful output from fusion and would be built and operated in the late 1980's is discussed. DOE

N79-33005# Sandia Labs., Albuquerque, N. Mex.
SANDIA'S PARTICLE BEAM FUSION PROGRAM
M. A. Sweeney 1979 38 p refs Presented at Idaho Section of ASME Fusion Energy Symp., Idaho Falls, Idaho, 19 Apr. 1979
(Contract EY-76-C-04-0789)
(SAND-79-0600C; Conf-790466-1) Avail: NTIS HC A03/MF A01

Pulsed electron and light ion beam accelerators and their application as igniters in inertial confinement fusion (ICF) reactors are considered. Traditionally, two requirements of ICF reactor operation are the most difficult to satisfy in conceptual designs. Adequate standoff of critical components from damaging pellet emissions must be assured, and the shot repetition rate must be consistent with the desired reactor power level at reasonable pellet gains. Progress in power compression, beam focusing and transport, first-wall protection schemes, and net-energy-gain target design shows how these requirements can be met. DOE

N79-33006# Brown, Boveri und Cie, A.G., Mannheim (West Germany).
TESTS ON A 50tera NEUTRON GENERATOR [TEST DES 50tera NEUTRONENGENERATORS]
H. Goergemanns Bonn DOKZENTBw 1978 39 p refs in GERMAN Sponsored by Bundesmin. der Verteidung
(BMVG-FBWT-78-14) Avail: NTIS HC A03/MF A01; DOKZENTBw DM 30

After the construction, testing, and beam optimization (with protons) at a neutron generator, the device was dismantled and transferred to Munster where it was reassembled. The reassembled generator and its components were again tested. Its performance with proton beams and deuterium was examined; an appropriate duoplasmatron source was developed. The objective was to generate an ion beam with the smallest possible diameter in order to be able to use smaller targets. A cooled reduction flange was developed to accomodate the small target in a large accelerator aperture. Results obtained with this modified generator and the beam characteristics measured are discussed.
Author (ESA)

N79-33007# Instituut voor Kernphysisch Onderzoek, Amsterdam (Netherlands). Dept. of Chemistry.
RADIOISOTOPE PRODUCTION WITH ELECTRON ACCELERATORS
G. A. Brinkman 1978 43 p refs
(Rept-78/5) Avail: NTIS HC A03/MF A01

The production of radioisotopes with electron accelerators is considered for thin secondary proton converters in combination with an electron sweep magnet. The production yields depend on the initial electron energy, the Z and thickness of the converter, the Z, A, and the thickness of the target, the geometric set up, and the cross section for a particular reaction. Simple formulas are given for the calculation of production yields under standard conditions with only the cross section per equivalent quantum and the fraction of the photons that hit the target as variables, and for the calculation of the dose rate at the production point. The units in which the yields are expressed in the literature (units of cross section, dose, electron beam intensity, monitor response) are discussed. Author (ESA)

N79-33008# Instituut voor Kernphysisch Onderzoek, Amsterdam (Netherlands).
THE 500 MeV, 10% d.F. LINEAR ACCELERATOR (MEA) UNDER CONSTRUCTION AT AMSTERDAM Status Report
P. J. T. Bruinsma and C. deVries Mar. 1979 22 p refs Presented at Conf. on Future Possibilities for Electron Accelerators, Charlottesville, Va., Jan. 1979
(Rept-79/1) Avail: NTIS HC A02/MF A01

The design parameters and the general lay-out of buildings and of the main components of the accelerator are presented. Some of the accelerator features which are typical for the Amsterdam machine are described. The performance obtained so far with the first part of the machine, with some remarks on the planning for the next 2 years is detailed. The experimental facilities under construction, the status, and the planning schedule are indicated, including the 140 MeV station, the 500 MeV beam handling system, the secondary beam area, and the 500 MeV electron scattering facility. Author (ESA)

N79-33009# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Electron Physics.
MICROTRON INJECTOR FOR LEP
M. Eriksson (Lund Univ.), D. Reistad (Instr. AB Scanditronix), and S. Rosander Mar. 1979 11 p refs
(TRITA-EPP-79-05) Avail: NTIS HC A02/MF A01

In the 15 to 100 GeV position electron Colliding Beam Machine (LEP) under study by the European Committee for Future Accelerators it is intended to use a 460 MeV accumulation ring (ACR) to collect a previously bunched beam of electrons or positrons before it is injected into a booster synchrotron. It is proposed to compress the longitudinal bunch length in the ACR by means of two r.f. systems that act on the beam one after the other like in the Positron Intensity Accumulator. Long beam pulses of 2 to 3 microsec can then be injected into ACR with multiturn injection. Compared to previous proposals the injected beam current can be reduced, and great savings in terms of peak microwave power can be achieved. Further economy and reliability in the LEP front-end machine can be gained by the use of an electron-positron racetrack microtron. The general concepts of such a microtron are indicated. Author (ESA)

N79-33010# Office of Radiation Programs, Washington, D. C. Technology Assessment Div.
A SURVEY OF THE AVAILABLE METHODS OF SOLIDIFICATION FOR RADIOACTIVE WASTES
William F. Holcomb Nov. 1978 99 p refs Sponsored by EPA
(PB-295214/1; ORP/TAD-78-2) Avail: NTIS HC A05/MF A01 CSCL 18G

The numerous solidification techniques and related matrix materials that are presently being offered or proposed for incorporating the radionuclides into an immobile materials are reviewed. Both high- and low-level waste solidification processes are covered. Key features of the equipment used in individual solidification processes are described. At present the high-level waste solidification methods are being developed by the Government, while the low-level waste solidification methods are being developed commercially. GRA

N79-33011# Battelle Columbus Labs., Ohio.
A SURVEY OF PACKAGING FOR SOLIDIFIED LOW-LEVEL RADIOACTIVE WASTE
Neil E. Miller Sep. 1978 46 p refs
(Contract EPA-68-01-3924)
(PB-295038/4) Avail: NTIS HC A03/MF A01 CSCL 18G

The packaging of low level radioactive wastes for disposal by shallow land burial and by ocean storage is investigated.

The 55 gallon steel drum, the most commonly used container for radioactive waste disposal in both methods of disposal, is studied due to structural stresses imposed by the handling and disposal operations, and by deterioration from corrosion in the disposal environment. The disposal environment, the waste form, and the waste container are each discussed in relation to the method of disposal. GRA

74 OPTICS

Includes light phenomena.

N79-33012 Catholic Univ. of America, Washington, D. C.
ANALYSIS OF THE MOLECULAR STUFFING STRENGTHENING PROCESS FOR GLASS FIBER OPTICAL WAVEGUIDES Ph.D. Thesis
Hamid Hojaji 1979 215 p
Avail: Univ. Microfilms Order No. 7921061

One way of strengthening glass fibers for optical waveguides is to introduce residual compressive stresses into their surface layer by physical and chemical tempering processes. Strengthening by developing compressive surface stresses requires cores of high thermal expansion coefficient alpha, and low glass transition temperature T sub g, and very thin clads of low alpha, and high T sub g. The combination of these two requirements was achieved by a method referred to as the molecular stuffing technique. The fiber preforms produced by this method have two composition profiles. One consists of index modifying agents, to produce a graded index profile in the optical core of the preform for high bandpass fibers; the outer portion is doped with agents to modify alpha and T sub G of the glass matrix. The concentration of the dopant in the outer portion is altered to obtain a very thin clad. Dissert. Abstr.

N79-33013# Lincoln Lab., Mass. Inst. of Tech., Lexington.
IMAGE RESTORATION BY SHORT SPACE SPECTRAL SUBTRACTION
Jae S. Lim 20 Feb. 1979 26 p refs
(Contract F19628-78-C-0002)
(AD-A070382; TN-1979-17; ESD-TR-79-27) Avail: NTIS HC A03/MF A01 CSCL 05/8

A new image restoration system that is applicable to the problem of restoring an image degraded by blurring and additive noise is presented. The system is developed by attempting to estimate more accurately the frequency response of typical image restoration filters available in the literature. The resulting system combined with its short space implementation is computationally simple and appears to compare quite well in performance with other restoration techniques. Some examples are given to illustrate the performance of the new image restoration system. GRA

N79-33014# Army Missile Research and Development Command, Redstone Arsenal, Ala. Physical Sciences Directorate.
NOISE IN COHERENT OPTICAL SYSTEMS: MINIMUM DETECTABLE OBJECT CONTRAST AND SPECKLE SMOOTHING
C. R. Christensen, B. D. Guenther, J. S. Bennett, and Nicholas George 19 Jul. 1976 58 p refs
(DA Proj. 1W3-62303-A-214)
(AD-A070040; DRDMI-TR-RR-7T-2) Avail: NTIS HC A04/MF A01 CSCL 20/6

A theory is presented which relates the minimum detectable contrast level for an object in the presence of noise to the statistics of the speckle. Consideration is given to smoothing of the noise by multiple looks and by area. Measurements of the minimum detectable contrast are made for two types of speckle noise. First, a coherent, plane wave is added to an ideal diffuse wave and the threshold of detection is established as a function of the beam ratio. Second, these results are compared to the technique of speckle smoothing using an N-fold intensity superposition of fully developed speckle patterns. Good agreement of experiments with theory is observed. The equivalence of four different methods of N-look averaging is shown and it is demonstrated that fully developed speckle leads to an image degradation independent of light level over a very wide range of light levels. Detection probabilities and false alarm probabilities are determined from observations on random arrays of high- and low-contrast discs. GRA

N79-33015# Mitre Corp., Bedford, Mass.
FIBER OPTICS FOR TACTICAL COMMUNICATIONS
C. W. Kleekamp Apr. 1979 63 p refs
(Contract F19628-79-C-0001)
(AD-A070274; MTR-37; ESD-TR-79-121) Avail: NTIS HC A04/MF A01 CSCL 20/6

This technical report describes the FY 77 MITRE/ESD Fiber Optics Technology Applications Program. The objective of this program was to define and demonstrate high-payoff applications of fiber optic technology to Air Force ground-based tactical C3 systems. During this program a fiber optic link for replacing 26-pair metallic cabling, currently used for 407L shelter interconnection and radio remoting, was designed and developed. This link was successfully demonstrated to Air Force users at the Bold Eagle 78 exercise in October 1977. GRA

N79-33016# Optical Design Service, Tucson, Ariz.
DEVELOPMENT OF TECHNIQUES FOR THE DESIGN OF ATHERMALIZED OPTICAL SYSTEMS Final Report, 1 Apr. - 1 Nov. 1978
R. A. Buchroeder Nov. 1978 66 p refs
(Contract DAAK40-78-M-0077)
(AD-A070257) Avail: NTIS HC A04/MF A01 CSCL 20/6

A theory and practice for athermalizing focus and boresight errors in optical systems is presented. Thermal properties of optical materials, mainly for the visible spectrum, are surveyed. Design techniques are suggested. GRA

N79-33017# Rockwell International Corp., Anaheim, Calif.
EXPLORATORY DEVELOPMENT ON SILICON MATERIAL FOR LADIR Final Report, 1 Aug. 1976 - 30 Sep. 1977
M. C. Arst Sep. 1977 133 p refs
(Contract F33615-76-C-5024)
(AD-A070740; C77-239/034A; AFML-TR-76-125) Avail: NTIS HC A07/MF A01 CSCL 17/5

This report contains a background description of the program, an evaluation of test approaches, test results, and a description of the process which has been developed to produce silicon material which meets the requirements of the contract. Where applicable, these subjects are discussed under the following tasks: Task I, Purification of Intrinsic Silicon; Task 2, Growth of Doped Silicon Crystals; Task 3, Crystal Material Evaluation; and Task 4, Definition of Growth Process. A major conclusion of the program is that the most suitable counter dopant for the residual boron concentration is antimony (Sb). This impurity has characteristics that are compatible with the other impurities in the material and remains stable during the on-chip microelectronics processing. In addition, it is easy to introduce into the silicon ingot during the doping process and distributes evenly over the bulk. GRA

N79-33018# Hughes Research Labs., Malibu, Calif.
SILICON-GERMANIUM ALLOYS FOR INFRARED DETECTORS Interim Report, 15 Aug. 1977 - 15 Aug. 1978
H. Winston and H. Kimura Wright-Patterson AFB, Ohio AFML Apr. 1979 36 p refs
(Contract F33615-77-C-5052; AF Proj. 2306)
(AD-A070932; AFML-TR-79-4043) Avail: NTIS HC A03/MF A01 CSCL 17/5

Silicon-germanium alloys in the range of 10 at .% germanium have been prepared and investigated. The object of the program is to prepare intrinsic Si-Ge with high enough absorption at 1.06 micrometers to be suitable for detectors at that wavelength and to investigate whether the changes in energy levels and optical properties of doped Si-Ge offer advantages for monolithic focal plane array applications over the corresponding doped silicon. The first year's work concentrated mostly on growing intrinsic material. After some attempts to prepare crystals by growing a succession of seeds of increasing Ge content, we found that alloys with greater than 10% Ge could be grown by the Czochralski technique directly from 0.5% (or even 0%) Ge seeds if a suitable growth rate was chosen. The necessary slow growth rate to achieve single crystals necessitated long exposures of the melt to contamination from the crucible, but the use of high-purity synthetic quartz crucibles reduced the uptake of electrically active impurities. Measurements on alloys that were not intentionally

doped yielded values for the shift in the energy level of boron from the case of a pure silicon host that were in agreement with the literature. GRA

N79-33019# General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
ADVANCED OPTICAL CERAMICS, PHASE 1 Quarterly Research and Development Status Report, 1 Dec. 1978 - 28 Feb. 1979
Solomon Musikant, R. A. Tanzilli, J. J. Gebhardt, H. W. Rauch, Sr., and A. Gatti 15 Mar. 1979 114 p refs
(Contract N00014-78-C-0466; DARPA Order 3387)
(AD-A070909; QRDSR-3) Avail: NTIS HC A06/MF A01 CSCL 17/5

The objective of this study is to identify and develop revolutionary advanced material suitable for electro-optical/electro-magnetic (EO/EM) windows, IR dome and radomes capable of meeting mission requirements anticipated for the 1990 decade and beyond. Experimental work was directed at synthesis and characterization of the candidate window materials. The toughness enhancement study and the optical modelling continue to indicate the feasibility of toughening of optical materials. In conjunction with known equilibria data, identification was made of the most feasible toughened systems for windows and enclosures. The most interesting candidates in this category are: (a) cubic stabilized ZrO2/ unstabilized ZrO2; (b) (A1203-Cr203) solid solution/unstabilized ZrO2, because in both of these cases the index of refraction of the second phase particle is anticipated to match closely that of the matrix. A systematic evaluation of potential new candidates was made and a theory for prediction of low coefficient of thermal expansion crystals was developed. This study identified, among others, the Beta' sialon ceramics as an important category. GRA

N79-33020# Dynetics, Inc., Huntsville, Ala.
DESIGN OF IRSS PROJECTORS Final Report, 30 Jan. - 30 Nov. 1978
30 Nov. 1978 171 p refs
(Contract DAAK40-78-C-0070)
(AD-A070898; MIRADCOM-78-0070-022) Avail: NTIS HC A08/MF A01 CSCL 17/5

This final report documents the efforts expended in performance of design of IRSS Projectors. The report is organized into eight sections, of which this instruction is one, plus supporting appendices. Following is Section 2, Summary, that outlines the salient study results and scope of the effort; Section 3, Technical Background details the basis of operation of the IRRS display system and projector set, Section 4, Requirements, which present the basis on which designs will be evaluated; Section 5, Test and Evaluation, a section which summarizes the findings of diagnostic tests performed on the projector-display system; these portions are followed by Section 6, Analyses, and Section 7, Performance of Selected Concept. These two sections describe analytically the capabilities of the present projector through development of a radiometric model, and demonstrate how performance is increased to meet the requirements by use of new components. Finally, in Section 8, Recommendations, are suggested additional tasks required to fully substantiate the recommended design. GRA

N79-33021# Laser Diode Labs., Inc., Metuchen, N. J.
LIGHT EMITTING DIODES FOR FIBER OPTIC COMMUNICATIONS Quarterly Report, 1 Jan. - 30 Jun. 1978
Albert Gennaro 30 Jun. 1978 37 p
(Contract DAAB07-76-C-8135)
(AD-A071158; QR-6; QR-7) Avail: NTIS HC A03/MF A01 CSCL 20/6

The design and fabrication of high speed etched-well light emitting diodes for fiber optic communications is discussed with regard to materials synthesis via LPE, wafer fabrication, and device assembly in a manufacturing environment. GRA

N79-33022# ITT Electro-Optical Products Div., Roanoke, Va.
LOW COST FIBER OPTIC CABLE ASSEMBLIES FOR LOCAL DISTRIBUTION SYSTEMS Final Report, 25 May 1977 - 30 Oct. 1978
R. E. Thompson and J. C. Smith 20 Nov. 1978 90 p
(Contract DAAB07-77-C-2681)
(AD-A070723) Avail: NTIS HC A05/MF A01 CSCL 20/6

This report describes the evaluation and optimization of low cost fiber optic cable using plastic clad silica fibers. As part of the program, silica core with RTV silicone cladding and protective plastic jacket fibers were used to produce the cables ECOM-1 and ECOM-2. The second phase of the contract consisted of developing an optimized optical fiber cable which would meet more stringent requirements and overcome the deficiencies found in cables ECOM-1 and ECOM-3 during the evaluation under extreme conditions. The optimized fiber optic cable was of the external strength member design, using 1 mm optical fibers. It met the requirements for optical (average attenuation at .82 micron was less than 10.5 db/km), mechanical and environmental performance. GRA

N79-33023# ITT Electro-Optical Products Div., Roanoke, Va.
DEVICES FOR FIBER OPTICS COMMUNICATION Final Report, 15 Apr. 1977 - 14 May 1978
G. W. Bickel and Larry E. Foltzer Wright-Patterson AFB, Ohio AFAL Dec. 1978 99 p
(Contract F33615-77-C-1058; AF Proj. 2001)
(AD-A070746; AFAL-TR-78-199) Avail: NTIS HC A05/MF A01 CSCL 20/6

This report is the final report on a one-year technology development program for fiber optic coupler components. The devices investigated and developed were three port couplers, directionals and 'T' couplers, and reflective and transmissive star couplers with 7, 19 and 32 ports or port pairs respectively. These coupler components were fabricated by direct fusion of plastic clad silica (PCS) fiber cores. Power division or distribution in these couplers is proportional to the ratio of the area of any port to that of the total coupler cross-sectional area, termed area ratio splitting. GRA

N79-33024# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
CALCULATION AND CONSTRUCTION OF WIDE BAND FAR INFRARED FILTERS (MPE BALLOON TELESCOPE) [BERECHNUNG UND BAU VON BREITBANDFILTERN IM FERNEN INFRAROT: BEREICH (MPE-BALLONTELESKOP)]
Wilhelm Konle Nov. 1978 89 p refs In GERMAN
(MPI-PAE/Extraterr-146) Avail: NTIS HC A05/MF A01

The theory, properties, and uses of various high band and wide pass band for infrared filters and filter combinations for astromomical applications are presented. Scattering, selective transmission absorption and reflection, the Fabry Perot interferometer, and grating techniques are employed. Special materials are used which were developed for scattering filters (black polyethylene, diamond dust in suspension or sedimented). Emphasis is given to the development of a filter combination for the MPE balloon experiment (70 to 100 micron and 100 to 150 micron region). It employs residual reflection filters as well as a scattering filter and enables 62% maximum transmission to be achieved in the KJ band with a stop band transmission of less than 1%. Author (ESA)

N79-33025# Heimann G.m.b.H., Wiesbaden (West Germany).
DEVELOPMENT OF SUITABLE SEMI-CONDUCTOR-EVAPORATED COATINGS FOR A COLOR-STRIPED VIDICON FOR A SINGLE TUBE COLOR CAMERA Final Report
Claus Kunze and Bernd Heimann Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 70 p refs In GERMAN; ENGLISH summary
(Contract BMFT-NT-0580)
(BMFT-FB-T-78-39) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 14,70

The development of a television pick-up tube for a one-tube color television camera, having specific performance characteristics, is described. The performance constraints are a broad spectral distribution of photosensitivity in the visible part of the spectrum, gamma = 1, low lag, high sensitivity, the use of simple technology, and a stripe filter integrated with the photoconductive layer. The first five constraints were met by the development of a CdSe-As2Se3-photoconductive layer, but owing to the high activation temperature of the layer, an integration with the stripe filter was not possible. This problem was solved by using a

fiber optic front plate. The prototype tubes were evaluated in an Interplex-Sicolor camera. It is shown that this pick-up tube is superior to a Sb2S3 vidicon with respect to sensitivity and color fidelity. The sensitivity is increased by a factor of three high color fidelity and by a factor of 10 with low incorrectness in the red channel. Author (ESA)

N79-33026# Research Inst. of National Defence, Stockholm (Sweden).
CALCULATION OF FORWARD SCATTERED INTENSITY FROM PARTICLES AT OPTICAL BEAM PROPAGATION
Kjell Oestberg Mar. 1979 15 p refs
(FOA-C-30164-E1) Avail: NTIS HC A02/MF A01

The propagation of an optical beam through a homogeneous medium with particles which scatter the light is considered. The ratio between the incoherent intensity in the forward direction and the coherent intensity is calculated for different models of the propagation medium. The models considered are isotropic scattering particles, particles which are so large that the far field in the near forward direction can be described by the Fraunhofer diffraction pattern, and finally some particle models of atmospheric haze. In general, the incoherent intensity is much smaller than the coherent intensity. It is furthermore shown that the relative amount of the incoherent intensity is a sensitive function of the particle sizes; big particles give much more incoherent intensity than small particles. Author (ESA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N79-33027# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PRELIMINARY EXPERIMENT OF NEUTRAL BEAM INJECTION HEATING IN JIPP T-2 DEVICE
T. Kuroda, Y. Oka, H. Okamura, H. Aoki, and T. Kunibe Jul. 1979 23 p refs
(IPPJ-392) Avail: NTIS HC A02/MF A01

Neutral beam injection heating was applied in JIPP T-2 Tokamak plasma. Time evolution of the ion temperature and the high energy component of ions were investigated. The ion temperature rise is scale as about 1.5 eV per kilowatt of injected beam power in average. Net electron heating is observed in the case of high power injection. The change in n sub e (t) and impurities associated with injection is described. Simultaneous application of heating of neutral beam injection and lower hybrid heating was carried out. G.Y.

N79-33028# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NUMERICAL CALCULATIONS ON THE PROPAGATION OF MICROWAVES IN HIGHLY OVER-DENSE MAGNETIZED PLASMA
Kazuo Minami Jul. 1979 27 p refs
(IPPJ-404) Avail: NTIS HC A03/MF A01

Propagation of microwaves in highly over-dense magnetized plasmas is numerically calculated. Well known cold plasma approximation and geometrical optics are used. It is shown that microwave can be propagated even in high-density magnetized plasmas, if an antenna launching the field with n parallel to the 2d power greater than 1 or n parallel to the 2d power less than 0 is adopted. Here, n parallel is the refractive index parallel to the static magnetic field which is perpendicular to the density gradient. However, the application of this principle to plasma diagnosis is limited, since in the case n parallel to the 2d power greater than 1 one has to insert the antenna into the density where omega sub p/omega approximately equals 1, whereas in the case n parallel to the 2d power less than 0, propagation can be expected only near the surface of the antenna. Author

N79-33029# Nagoya Univ. (Japan). Inst. of Plasma Physics.
CROSS-FIELD ELECTRON HEAT TRANSPORT DUE TO HIGH FREQUENCY ELECTROSTATIC WAVES
Hiroshi Naitou 7 Jul. 1979 31 p refs
(IPPJ-405) Avail: NTIS HC A03/MF A01

Cross-field electron heat diffusion due to thermally excited high frequency electrostatic waves propagating almost perpendicular to the magnetic field was studied using a two-and-one-half-dimensional simulation code. It is shown that the electron heat diffusion coefficient, D sub H, is an order of magnitude greater than the electron self-diffusion coefficient D sub p, which is essentially collisional. The characteristic feature of wave transport is observed, namely an increase of D sub H with increasing values of the characteristic temperature scale length. The heat diffusion coefficient D parallel sub H and D perpendicular sub H for the parallel and perpendicular temperatures show quite different magnetic field scalings since D parallel sub H is due to ion modes while D perpendicular sub H arises from electron modes. Author

N79-33030# Nagoya Univ. (Japan). Inst. of Plasma Physics.
COMPETITION OF WEAKLY COLLISIONAL AND NEIGHBORING WAVE EFFECTS FOR THE DESTRUCTION OF AMPLITUDE OSCILLATIONS
Osamu Fukumasa, Hirotada Abe, and Ryohei Itatani Jul. 1979 17 p refs
(IPPJ-407) Avail: NTIS HC A02/MF A01

The destruction mechanism of the amplitude oscillation in the system of a cold beam and a weakly collisional plasma are examined. The amplitude oscillation can be destroyed either by the weak collision effects or by the effects of the neighboring waves of the most unstable mode. Either of them competes with another in playing a decisive role for the destruction. If an expansion parameter is constant, the system becomes stable for the growth of the neighboring waves, as the beam velocity increases. Author

N79-33031# Nagoya Univ. (Japan). Inst. of Plasma Physics.
AN ION SOURCE PLASMA STARTING FROM A COLD LaB6 CATHODE 1
Joshin Uramoto Jul. 1979 27 p refs
(IPPJ-406) Avail: NTIS HC A03/MF A01

A hydrogen plasma source is produced from a cold hollow LaB6 cathode which is heated stably within 3 sec by a concentrated predischarge below 200 V. It should be noted that misdischarges diffusing to chamber walls and damages of the cathode due to ion bombardments are avoided. Moreover, the plasma source is stable as external electric fields are removed from there. Author

N79-33032# Nagoya Univ. (Japan). Inst. of Plasma Physics.
COMPRESSION OF TOROIDAL PLASMA BY IMPLODING PLASMA-LINER
Kazunari Ikuta Jul. 1979 14 p refs
(IPPJ-408) Avail: NTIS HC A02/MF A01

A concept of compressing a plasma in a closed magnetic configuration by a version of liner implosion flux compression technique is considered. The liner consists of a dense plasma cylinder, i.e. the plasma-liner. Maximum compression ratio of toroidal plasma is determined just by the initial density ratio of the toroidal plasma to the liner plasma because of the Rayleigh-Taylor instability. A start-up scenario of plasma-liner is also proposed with a possible application of this concept to the creation of a burning plasma in reversed field configurations, i.e. burning plasma vortex. Author

N79-33033# Nagoya Univ. (Japan). Inst. of Plasma Physics.
INITIAL FREQUENCY SHIFT OF LARGE AMPLITUDE PLASMA WAVE. 2: ION ACOUSTIC WAVE
K. Yamanaka, R. Sugihara, Y. Ohsawa, and T. Kamimura Jul. 1979 22 p refs
(IPPJ-409) Avail: NTIS HC A02/MF A01

A nonlinear complex frequency shift of the ion acoustic wave in the initial phase defined by $0 < t < t$ sub c is obtained, which is valid for arbitrary phi sub 0 and omega sub S/k as long as omega sub S much greater than gamma sub L, where phi sub 0, omega sub S, gamma sub L and t sub c are the initial value of the potential value of the potential, the frequency of the wave, the linear Landau damping coefficient and the time for the first minimum of the amplitude oscillation, respectively. A simulation study is also carried out. The results confirm the validity of the theory. Author

N79-33034# Nagoya Univ. (Japan). Inst. of Plasma Physics.
SINGLE ELECTRON CAPTURE INTO Ar(+) EXCITED STATES IN Ar2 (+) Na COLLISION BELOW 12 keV. 1: ABSOLUTE MEASUREMENT OF EMISSION CROSS-SECTION
Atsushi Matsumoto, Seiji Tsurubuchi, Kazuhiko Okuno, Shunsuke Ohtani, Tsuruji Iwai, and Yozaburo Kaneko Aug. 1979 26 p refs
(IPPJ-410) Avail: NTIS HC A03/MF A01

Emission spectra between 2800 and 6000 A were observed at the ionic energies from 0.2 to 12 keV. Absolute measurements of emission cross-sections were made for the emission lines coming from AR(2+) excited states at 4 and 8 keV with a crossed-beam technique. Processes of single-electron capture into the AR(2+) 4p- and 4p'-states, with exothermicity of a few eV, take place dominantly while the endothermic processes producing AR(2+) in the 4d- and 5s-states occur with small cross-sections. The sum of the cross-sections for electron capture into the excited states observed is comparable with the total single-electron capture cross-section estimated from attenuation measurements of ion currents. Possible errors and uncertainties are discussed. G.Y.

N79-33035*# Stanford Univ., Calif. Inst. for Plasma Research.
VARIATIONAL DESCRIPTION OF THE POSITIVE COLUMN WITH TWO-STEM IONIZATION
F. W. Crawford Sep. 1979 32 p refs
(Grant NGL-05-020-176)
(NASA-CR-162314; SU-IPR-795) Avail: NTIS HC A03/MF A01 CSCL 20I

The ionization balance in diffusion dominated discharges which depends on both one and two step ionization processes is considered. The Spenke diffusion equation (D sq delta n + neutrino n + sq kn = 0) describing such conditions is solved by the Rayleigh-Ritz variational method. Simple analytic approximations to the density profile, and the similarity relation between neutrino,k,D and the discharge dimensions, are derived for planar and cylindrical geometry, and compared with exact computations for certain limiting cases. A.W.H.

N79-33036# Florida Univ., Gainesville. Dept. of Engineering Sciences.
HARTMANN FLOWS IN THE MHD GENERATOR CONFIGURATION
Rush E. Elkins, III, Thomas A. Trovillion, and E. Rune Lindgren Jun. 1979 60 p refs
(Contract N00014-76-C-0410)
(AD-A070080; TR-01-002) Avail: NTIS HC A04/MF A01 CSCL 20/9

Specific features and characteristics of Hartmann flows in the Faraday generator configuration are reported. These features concern the effect of longitudinal baffling along the insulating duct walls, effects of slip between gas-liquid phases in the flow. The report also contains an analysis of a compensating system of a Faraday generator as well as a one-dimensional zero-slip model of a two-phase MHD flow through the generator. GRA

N79-33037# Naval Research Lab., Washington, D. C.
BRILLOUIN BACKSCATTER DEPENDENCE UPON PULSE AMPLITUDES, TIMING, TARGET MATERIAL AND GEOMETRY
B. H. Ripin and E. A. McLean 15 Jun. 1979 12 p refs
(AD-A070300; NRL-MR-3964) Avail: NTIS HC A02/MF A01 CSCL 20/5

The stimulated Brillouin backscatter instability plays an important role in the laser-plasma interaction for short (is less than 1 nsec), high-irradiance (is greater than 10 to the 13 power W/sq cm) Nd-laser pulses. Laser light is observed to be directly backscattered and the total absorption fraction reduced by this mechanism operating in the underdense region of plasma. Long underdense plasma scale lengths, which are conductive to large simulated backscatter, are set up, for example, in a plasma preformed by a small prepulse, longer incident pulses and larger plasmas, and by temporally structured pulses designed for laser fusion. The density gradient present when the high-intensity pulse strikes the target (and hence the degree of backscatter) is expected to be a function of several variables. Here we show the variation of backscatter with main pulse-prepulse timing and amplitudes, target material and geometry. Author (GRA)

N79-33038# Naval Research Lab., Washington, D. C.
GENERATION OF A ROTATING LIQUID LINER BY TANGENTIAL INJECTION Interim Report
R. L. Burton, P. J. Turchi, D. J. Jenkins, R. E. Lanham, and J. Cameron 25 Jun. 1979 18 p refs
(RR0110941)
(AD-A070890; NRL-MR-4025) Avail: NTIS HC A02/MF A01 CSCL 20/9

Efficient compression of low mass-density payloads by the implosion of higher mass-density liquid cylinders or liners, as in the NRL LINUS concept for controlled thermonuclear fusion, requires rotation of the liner material to avoid Rayleigh-Taylor instabilities at the liner-payload interface. Experimentally, such implosions have been demonstrated with liners formed within rotating implosion chambers. The present work uses a scale-model experimental apparatus to investigate the possibility of creating liner rotation by tangential injection of the liquid liner material. Different modes of behavior are obtained depending on the fluid exhaust procedures. Right-circular, cylindrical free surfaces are achieved with axial exhaust of fluid at radii interior to the injection nozzles, for which the liner exhibits a combination of solid-body and free vortex flows in different regions. Measurements allow estimates of power losses to viscous shear, turbulence, etc. A simple model based on open-channel flow is then derived, which is in good agreement with experiment, and is used to extrapolate results to the scale of a possible LINUS fusion reactor. GRA

N79-33039# Maryland Univ., College Park. Dept. of Physics and Astronomy.
STABILITY PROPERTIES OF A FIELD-REVERSED ION LAYER IN A BACKGROUND PLASMA
Hwan-sup Uhm and Ronald C. Davidson 1978 49 p refs
(Contracts N00014-75-C-0309; N00014-67-A-0239)
(AD-A070611) Avail: NTIS HC A03/MF A01 CSCL 20/9

Stability properties of an intense proton layer (P-layer) immersed in a background plasma are investigated within the framework of a hybrid model in which the layer ions are described by the Vlasov equation, and the background plasma electrons and ions are described as macroscopic, cold fluids. Electromagnetic stability properties are calculated for flute perturbations about a P-layer with rectangular density profile. Stability properties are investigated including the effects of (1) the equilibrium magnetic field depression produced by the P-layer; (2) transverse magnetic perturbations; (3) small (but finite) transfer temperature of the layer ions; and (4) the dielectric properties of the background plasma. G.Y.

N79-33040# Maryland Univ., College Park. Dept. of Physics and Astronomy.
AXIALLY-DEPENDENT EQUILIBRIUM OF AN UNNEUTRALIZED ELECTRON BEAM IN AN AXIAL MAGNETIC FIELD
J. Guillory Jun. 1979 19 p
(Contracts N00014-75-C-0309; N00014-67-A-0239)
(AD-A070592) Avail: NTIS HC A02/MF A01 CSCL 20/9

Virtual cathode formation in vacuum-propagating beams may be more widespread than previously recognized. The spin death of parallel beam energy by E sub r x B sub z rotation in front of a density pileup, may assist or steepen the axial density gradient, since the rotation speed tends toward Brillouin flow. Self-consistent BGK-like axially dependent equilibria, in which the space charge effects determine the axial extent and profile of the beam is described. Generalization to axially monuniform magnetic fields is relatively straightforward. The problem is treated in a purely one-dimensional way, keeping the electrostatic effects of E sub z electric fields but not the effects of beam rotation caused by E sub r. Results are generalized to include E sub r. The conclusions are summarized. GRA

N79-33041# California Univ., Los Angeles. Plasma Physics Group.
SIMULATION OF LOWER-HYBRID HEATING IN A NONUNIFORM PLASMA SLAB
Viktor K. Decy, G. M. Morales, and J. M. Dawson May 1979 40 p refs

(Contract N00014-75-C-0476)
(AD-A070491; PPG-411) Avail: NTIS HC A03/MF A01 CSCL 20/9

A computer simulation study of the excitation of lower hybrid waves by external sources and the associated plasma heating is presented. A plasma slab with a nonuniform density profile is modeled with a 2 1/2 dimensional electrostatic particle code. Both a finite-length electrostatic antenna and a single wave exciter are considered. The frequency is chosen so that a wave conversion layer exists in the plasma. It is found that a narrow sheath is formed at the plasma edge and the dominant effect is surface electron heating within that region. Ponderomotive force effects as well as the nonlinear generation of harmonics and subharmonics also occur. A low amplitude lower hybrid wave is observed to be excited by the sources and propagates to the wave conversion layer where it is absorbed. GRA

N79-33042# STD Research Corp., Arcadia, Calif.
MAGNETOGASDYNAMIC PHENOMENA IN PULSED MHD FLOWS Interim Summary Report, 1 Aug. 1977 - 31 Oct. 1978
S. T. Demetriades, D. M. Markham, C. D. Maxwell, D. A. Oliver, and T. F. Swean Jan. 1978 66 p refs
(Contract N00014-77-C-0574)
(AD-A070590; STD-UP-002-77-1; STDR-79-2) Avail: NTIS HC A04/MF A01 CSCL 20/9

This report examines some of the detailed structure of magnetogasdynamic flows encountered in pulsed magnetohydrodynamic (MHD) generators. Two illustrations of magnetogasdynamic nonuniformities are considered. The first is for conventional explosive-driven MHD generators. Here we reveal the detailed structure of the deceleration of the conducting slug formed by the compression of plasma between the explosive-driven shock wave and its following contact surface. The second illustration is for steady high Magnetic Reynolds Number channel flows. Here we exhibit the nonuniform manner in which the external magnetic field is diffused into the plasma and the corresponding nonuniform deceleration of the flow. GRA

N79-33043# Polytechnic Inst. of New York, Farmingdale. Dept. of Electrical Engineering.
STUDIES ON THE INTERACTIONS BETWEEN ELECTROMAGNETIC FIELDS AND PLASMAS Final Report, Apr. 1974 - Sep. 1978
B. R.-S. Cheo, E. E. Kunhardt, S. P. Kuo, and T. Q. Yip Apr. 1979 317 p refs
(Grant AF-AFOSR-2668-74; AF Proj. 9751)
(AD-A071017; POLY-EE-79-053; AFOSR-79-0752TR) Avail: NTIS HC A14/MF A01 CSCL 20/9

This is the final report on a variety of subjects in the non-linear interactions between electromagnetic fields and plasmas. Work includes both theoretical and experimental efforts. Principal results are: the first experimental verification of the existence of two distinct group velocities in a non-linear dispersive medium; and the development of a general vector theory of parametric excitation of plasma waves in a magnetized plasma. GRA

N79-33044# Northrop Research and Technology Center, Palos Verdes Peninsula, Calif.
PLASMA SHEATH PROCESSES Final Technical Report, 15 Aug. 1977 - 31 Oct. 1978
William H. Long, Jr. Wright-Patterson AFB, Ohio AFAPL Apr. 1979 123 p refs
(Contract F33615-77-C-2048)
(AD-A070819; NRTC78-46R; AFAPL-TR-79-2038) Avail: NTIS HC A06/MF A01 CSCL 20/9

A model of the plasma sheath in high pressure ionized gas flows is presented. Nonequilibrium electron energy distributions are determined from a numerical solution of the collisional Boltzmann equation in the presence of strong field and density gradients. Self-consistent coupling to the electric field, ion kinetics and gas dynamics is included. In subsonic flows, the sheath and the boundary layer can be treated independently. A stability analysis indicates two forms of thermal instability occur in the cathode sheath at high pressures. GRA

N79-33045# Naval Research Lab., Washington, D. C. Plasma Radiation Group.
DIRECT SOLUTION OF THE EQUATION OF TRANSFER USING FREQUENCY AND ANGLE-AVERAGED PHOTON ESCAPE PROBABILITIES Interim Report
J. P. Apruzese (Science Applications, Inc.) and J. Davis 21 Jun. 1979 23 p refs Sponsored in part by DNA
(AD-A070545; NRL-MR-4017) Avail: NTIS HC A02/MF A01 CSCL 20/9

A formalism is developed which permits direct steady-state solution of the transfer equation using escape probabilities averaged over angle and frequency. A matrix of probability-based coupling coefficients, which are related to the kernel K1, is used to obtain the source function for a Doppler profile in plane-parallel geometry. Comparison is made with exact solutions, establishing the high accuracy of the technique. The method is extendable to different physical situations by simply modifying the coupling coefficients. GRA

N79-33046# Naval Research Lab., Washington, D. C.
OPTIMIZATION OF STABILIZED IMPLODING LINER FUSION REACTORS Interim Report
P. J. Turchi, D. L. Book, and R. L. Burton 25 Jun. 1979 14 p refs Presented at the 10th Symp. on Fusion Technol., Padova, Italy, 4-8 Sep. 1978
(RR0110941)
(AD-A070889; NRL-MR-4029) Avail: NTIS HC A02/MF A01 CSCL 20/9

In the NRL LINUS concept for controlled fusion systems, a rotating liquid metal cylinder or liner is imploded onto a trapped plasma/magnetic field payload to obtain fusion temperatures and near-megagauss magnetic field levels by adiabatic compression. The combined use of linear rotation and a free-piston driving technique eliminates Rayleigh-Taylor instabilities and permits safe, repetitive implosion-reexpansion cycles. Optimization of system size is accomplished in terms of the implosion radius-ratio and liner compressibility. Trade-offs between reactor size and initial plasma temperature are indicated. GRA

N79-33047# Naval Research Lab., Washington, D. C.
LONG-PULSE LASER-PLASMA INTERACTIONS AT 10 TO THE 12TH POWER-10 TO THE 15TH POWER W/cm SQUARED Interim Report
B. H. Ripin, R. R. Whitlock, F. C. Young, S. P. Obenschain, and E. A. McLean 15 Jun. 1979 12 p refs
(AD-A070462; NRL-MR-3965) Avail: NTIS HC A02/MF A01 CSCL 20/9

Laser-plasma interaction physics including absorption, plasma formation, heating, plasma expansion and energy transport, are examined for 3-nsec Nd-laser irradiances between 10 to the 12th and 10 to the 15th power W/sq cm. Efficient energy deposition and conditions favorable to ablative acceleration are found at 10 to the 12th to 10 to the 13th power W/sq cm. whereas reduced absorption, hot electrons and fast ions are seen at 7 times 10 to the 14th power W/sq cm. Suitability of the observed physics to laser-pellet fusion is discussed. GRA

N79-33048# Naval Research Lab., Washington, D. C.
AN MHD INSTABILITY PRIMER Interim Report
Wallace Manheimer and Chris Lashmore-Davies 29 Jun. 1979 140 p
(AD-A071099; NRL-MR-4000) Avail: NTIS HC A07/MF A01 CSCL 20/3

This report is a simple, self-contained treaties on MHD instabilities in plasmas. It is the result of a one year work assignment for one of us (WMM) at the Culham Laboratory in Abingdon, England. GRA

N79-33049# California Univ., Livermore. Lawrence Livermore Lab.
MATERIALS CONSIDERATIONS FOR INERTIALLY-CONFINED FUSION REACTORS (ICFR)
J. Hovingh 5 Jun. 1978 33 p refs Presented to Faculty Inst., Inertial Confinement Fusion, Argonne, Ill., 5-9 Jun. 1978
(Contract W-7405-eng-48)
(UCRL-81206; Conf-7806114) Avail: NTIS HC A03/MF A01

The material considerations for inertially confined fusion reactors are discussed. A comparison of the material considerations for inertially confined reactors is made with those of magnetically confined reactors. The lithium fall reactor concept is used as an

example of the freedom from constraints intrinsic to inertially-confined fusion reactors. DOE

N79-33050# Los Alamos Scientific Lab., N. Mex.
SOME PROPERTIES OF THE REVERSE-FIELD Z-PINCH: AN OVERVIEW
Richard Gerwin May 1979 28 p refs
(Contract W-7405-eng-36)
(LA-7798-MS) Avail: NTIS HC A03/MF A01

The ideal MHD (macrostability) rationale for this configuration is reviewed and the associated drift velocity profiles (across and along B vector) are discussed. A derivation of the Suydam criterion is given that clarifies the relevant physics. A number of specific examples are displayed. The drift velocity profiles are significant as regards the microstability properties of the profiles. The Suydam stability is seen to depend very sensitively on the position of the toroidal field reversal point. DOE

N79-33051# California Univ., Los Angeles. Dept. of Electrical Sciences and Engineering.
MICROWAVE EXPERIMENTAL SIMULATION OF LASER PLASMA INTERACTIONS Combined Quarterly Status Report, 1 Oct. 1978 - 30 Apr. 1979
Neyille C. Luhmann, Jr. May 1979 27 p refs
(Contract EY-76-C-03-0010-021)
(UCLA-ENG-7931) Avail: NTIS HC A03/MF A01

High power microwave sources and large diameter quiescent laboratory plasmas were used to investigate the absorption and transport of energy in laser-pellet interactions. The large spatial scale-lenths (1-4 m) and relatively long time-scales (10 nsec-10 micron sec) permit the careful measurement of localized electric and magnetic fields as well as particle energy and density. Experiments described that are relevant to the laser fusion program concern stimulated Brillouin scattering in the undersense regions of the blow-off plasma, and the generation of quasi-static magnetic fields in the vicinity of the critical layer due to resonance absorption, nonparallel temperature and density gradients and parameteric instabilities. DOE

N79-33052# Oak Ridge National Lab., Tenn.
ELECTRON-CYCLOTRON HEATING OF TOROIDAL PLASMA WITH EMPHASIS ON RESULTS FROM THE ELMO BUMPY TORUS (EBT)
R. A. Dandl, H. O. Eason, and H. Ikegami May 1979 70 p refs Submitted for publication
(Contract W-7405-eng-26)
(ORNL/TM-6703) Avail: NTIS HC A04/MF A01

Some of the more relevant electron cyclotron heating ECH propagation processes and heating mechanisms are considered. Results are presented from some of the more recent toroidal ECH experiments, including tokamaks, but principally from the ELMO Bumpy Torus (EBT). In the last section, we discuss the technological considerations so important to successful applications of ECH to plasma experiments. DOE

N79-33053# California Univ., Berkeley. Lawrence Berkeley Lab.
ION BEAM PRODUCTION IN THE PLASMA FOCUS DEVICE
R. L. Gullickson 13 Apr. 1979 20 p refs Presented at 2d Intern. Conf. on Energy Storage, Compression, and Switching, Venice, Italy, 5 Dec. 1978
(Contract W-7405-eng-48)
(UCRL-81962; Conf-781247) Avail: NTIS HC A02/MF A01

Livermore results are reviewed and compared with recent measurements of high energy ions in the plasma focus device at other laboratories. Diagnostic techniques for measuring high energy ions including nuclear activation, particle track detectors, solid state (silicon PIN) detectors, and neutron time-of-flight measurements are also discussed. DOE

N79-33054# Oak Ridge National Lab., Tenn.
EFFECTS OF HOT ELECTRONS ON MAGNETOHYDRODYNAMIC MODES IN EBT
D. B. Nelson Jun. 1979 26 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6824) Avail: NTIS HC A03/MF A01

A fully electromagnetic, finite beta, Vlasov - Maxwell model, consisting of three species in an inhomogeneous slab geometry with gravity is used to study the effect of hot electrons in the electron beam technique (EBT). If no hot electrons are present, the Vlasov model agrees with the magnetohydrodynamic model. If the density of hot electrons is small, but their temperature is sufficiently large, the Vlasov model predicts stabilization of magnetohydrodynamic modes. For EBT parameters this occurs at Beta = 10 to 20%, in agreement with experimental observations. The Vlasov model also validates, for EBT parameters, the assumption of rigid hot electrons made in a previous magnetohydrodynamic analysis incorporating the full EBT geometry. DOE

N79-33055# Sandia Labs., Albuquerque, N. Mex.
HYDROGEN RETENTION AND RELEASE IN FIRST-WALL COATINGS FOR TOKAMAKS
B. L. Doyle and F. L. Vook 23 Apr. 1979 11 p refs Presented at Intern. Conf. on Met. Coatings, San Diego, Calif., 23 Apr. 1979
(Contract DE-AC04-76-DP00789)
(SAND-78-2128C; Conf-790442-11) Avail: NTIS HC A02/MF A01

The hydrogen retention and release of two first-wall coating materials, TiB2 and B4C, were measured. Hydrogen is released from TiB2 at substantially lower temperatures or laser energy fluxes (pulsed annealing) than for B4C. Hydrogen also diffuses to a much smaller extent into TiB2 than into B4C. On the basis of tritium inventory control, TiB2 appears to be superior to B4C. DOE

N79-33056# Sandia Labs., Albuquerque, N. Mex.
HIGH CURRENT PULSED LINEAR ION ACCELERATORS FOR INERTIAL FUSION APPLICATIONS
S. Humphries, Jr., G. Yonas, and J. W. Poukey 1978 16 p refs Presented at the Metal Deformation Modeling: Stress Relaxation of Aluminum, Kansas City, Mo., May 1978
(Contract EY-76-C-04-0789)
(SAND-78-0778C; Conf-780515-2) Avail: NTIS HC A02/MF A01

Methods of neutralizing ion beams with electrons within the accelerator volume to achieve higher currents were studied to arrive at an inexpensive accelerator that can advantageously use existing pulsed voltage technology while being conservative enough to achieve a high repetition rate. Typical output parameters for reactor applications would be be an O+ beam of 30 kA at 300 MeV. Reactor scaling studies and the physics of neutralized linear accelerators using magnetic fields to control the electron dynamics are described. Recent results are discussed from PULSELAC, a five stage multikiloampere device being tested. DOE

N79-33057# Columbia Univ., New York. School of Engineering and Applied Science.
DAMAGE OF METAL SURFACES BY A HOT DENSE DEUTERIUM PLASMA Ph.D. Thesis
Nicholas Frank Panayotou 1978 96 p refs
(Contract EG-77-S-02-4393)
(COO-4393-03; Rept-78) Avail: NTIS HC A05/MF A01

The effect of differences in alloy chemistry and systematic changes in microstructural interface density on the occurrence of unipolar arcing was studied. The effect of thermionic emission is examined by comparing the refractory metals W, Nb, and Nb-751 alloy to the nonrefractory stainless steels, AISI 304, 316, and Nimonic PE-16. The effect of alloying additions is examined by comparing Mo containing 316 and Mo free 304 stainless steels as well as Zr containing Nb-751 and Zr free Nb. The effect of interface density is examined by systematically varying the density of microstructural interfaces in AISI 4130, a ferritic steel. Although most of the metals and alloys studied are candidate fusion reactor materials, 4130 was chosen on the basis of the ability to modify the density of microstructural interfaces in the material by heat treatment. The results are discussed with respect to available unipolar arcing theory. DOE

N79-33058# Los Alamos Scientific Lab., N. Mex.
FLUX COMPRESSION GENERATORS AS PLASMA COMPRESSION POWER SOURCES
C. M. Fowler, R. S. Caird, D. J. Erickson, B. L. Freeman, and W. B. Garn 1979 25 p refs Presented at 2d Intern. Conf.,

on Energy Storage, Compression and Switching, Venice, Italy, 5-8 Dec. 1978
(Contract W-7405-eng-36)
(LA-UR-79-1064; Conf-781247-1) Avail: NTIS HC A02/MF A01

A survey is made of applications where explosive-driven magnetic flux compression generators are used to directly power devices that produce dense plasmas. Representative examples are discussed that are specific to the theta pinch, the plasma gun, the dense plasma focus, and the Z pinch in order to illustrate the high energy and power capabilities of explosive generators. An application employing a rocket-borne, generator powered plasma gun emphasizes the size and weight potential of flux compression power supplies. Recent results from a local effort to drive a dense plasma focus are provided. Imploding liners are discussed in the context of both the theta and Z pinches.
DOE

N79-33059# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
RESEARCH REPORT, 1977 Annual Report [FORSCHUNGSBERICHT 1977]
H. Zwicker 1977 50 p refs In GERMAN
Avail: NTIS HC A03/MF A01

Waves and plasma heating, the High Tension Belt-Pinch Plasma (HTBP), laser applications, and plasma focussing were studied. Highlighted topics include the operation of the HTBP (the mehanical construction of which was recently completed), the successful starting up of the Theta Pinch Experiment and preliminary measurements of state variables, pulsed scattering diagnostics with heterodyne reception in the field of laser applications, and the completion of authorization procedures for the new 500 kJ Plasma Focus Building. Author (ESA)

N79-33060# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
THE ENLARGEMENT OF FAST AVALANCHE PHOTODIODE BANDWIDTHS BY CAPACITANCE COMPENSATION [UNTERSUCHUNGEN ZUR VERGROESSERUNG DER BANDBREITE SCHNELLER AVALANCHE-PHOTODIODEN DURCH KAPAZITAETSKOMPENSATION]
H. Zwicker 1977 63 p refs In GERMAN
(IPF-77-3) Avail: NTIS HC A04/MF A01

Photodiodes are convenient devices for plasma diagnostics. The diode signal is meaningful only when it exceeds that due to amplifier noise. This implies a load resistance greater than 30 kV. Diode and stray capacitance (6 to 20 pF) limit the frequency bandwidth to below the required 3.33 Hz. Capacity compensation enables these criteria to be fulfilled. The corresponding electronics (negative impedance converter compensation, null compensation) are described together with a detailed analysis of their functions. Author (ESA)

N79-33061# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
ANALYTICAL TREATMENT OF RUNAWAY EFFECTS [ANALYTICSCHE BEHANDLUNG DES RUNAWAY-EFFEKTS]
H. Zwicker 1977 75 p refs In GERMAN
(IPF-77-4) Avail: NTIS HC A04/MF A01

The importance of runaway effects in plasma devices was studied. A Lorentz gas model is used to describe the effect in a constant electric field. Electrons experience only Coulomb collisions with infinitely heavy ions. The probability density is assumed to be constant in local space. The velocity space is divided into two regions. These are a low velocity region, where the density function is determined from collisions and found to be isotropic, and a high velocity region in which a quasi free acceleration of the particles is generated by the electric fields. The corresponding kinetic equations are normalized. Analytical solutions are given for both regions together with a coupling function which assures a constant number of particles. Particle densities, current densities, and energy densities associated with the effect are explained.
Author (ESA)

N79-33062# National Physical Lab., Teddington (England). Div. of Electrical Science.
DIAGNOSIS OF THE JET PLASMA USING ELECTRON CYCLOTRON EMISSION
D. V. Bartlett (Sydney Univ.) and A. E. Costley Mar. 1979 24 p refs Submitted for publication
(NPL-DES-53) Avail: NTIS HC A02/MF A01

Recent developments in Tokamak electron cyclotron emission are reviewed with particular attention being paid to diagnostics for the jet plasma. An improved calculation of the likely emission from this plasma is made and the diagnostic potential is re-evaluated. It is shown that in addition to the earlier predicted possibilities it ought to be possible to obtain the electron temperature with space and time resolution from data obtained on a single plasma pulse. In addition, by measuring the emission at particular frequencies it ought to be possible to investigate any very fast fluctuations in the temperature (nearly greater than 1 microsectime scale) that might occur at specific positions in the plasma. Some techniques for carrying out be necessary measurements are recommended and areas where futher work is required are identified. Finally, a diagnostic possibility is suggested. Author (ESA)

N79-33063# Research Inst. of National Defence, Stockholm (Sweden).
MAGNETIZED WHIRLS IN PLASMA DISCHARGES
Erik A. Witalis May 1979 30 p refs Presented at 2nd Intern. Conf. on Energy Storage, Compression and Switching, Venice, 5-8 Dec. 1978 Sponsored by Chalmers Univ. of Technol., Goteborg
(FOA-C-20303-D9) Avail: NTIS HC A03/MF A01

Plasma focus is briefly described with emphasis on its capabilities as a neutron source. The filamentary whirl structures observed in the discharge plasma are described. Starting with a simple, early, and particularly well established case of vorticity imparted by a rotational electric field to the plasma in magnetohydrodynamic generators, a general derivation is then outlined proving that such magnetically induced rotation is a general feature for the normally Hall-conducting magnetized plasma. Physical interpretation of the effect are given and objection to it are critically reviewed as is also a theory proposing radiation cooling as the cause of plasma filamentation. In conjunction with a generalized Bennett relation theoretical whirl properties are predicted and found to agree with observations. Mechanisms that relate the whirls to nuclear fusion reaction conditions are tentatively indicated. Author (ESA)

N79-33064# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
ON THE SCALING OF MAGNETIC PLASMA CONFINEMENT UNDER CLASSICAL CONDITIONS
B. Lehnert Apr. 1979 15 p refs
(TRITA-PFU-79-05) Avail: NTIS HC A02/MF A01

The idealized case of classical plasma confinement in a closed magnetic bottle is theoretically discussed. The scaling laws obtained for Tokamaks and similar devices indicate that large linear dimensions and considerable heating powers are required to reach the parameter regime of thermonuclear conditions. In light of the great potentialities of fusion energy, the need for more powerful confinement schemes is shown. An alternative scheme is sought which provides stable confinement of a pure plasma while minimizing plasma losses and increasing beta values. No suggestion is made for specific field geometries which could meet these requirements. Reactor technological aspects are also excluded from the discussion. Author (ESA)

N79-33065# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
FAST MAGNETOSONIC WAVE SPECTRUM IN A TRANSVERSELY MAGNETIZED PLASMA CAVITY
M. Bures Apr. 1979 36 p refs Sponsored by European Communities Comm.
(TRITA-PFU-79-06) Avail: NTIS HC A03/MF A01

The fast magnetosonic wave spectrum is calculated for a transversely magnetized plasma cavity, including the symmetric as well as the nonsymmetric mode spectrum. The calculations serve as a theoretical model for the internal ring apparatus with a poloidal static magnetic field. The influence of a nonuniform density and of vacuum layers at the plasma boundary on the wave spectrum is discussed. It is shown that in the case of high plasma density a great number of magnetosonic modes lie

below omega sub ci. The influence of the density profile is to shift the frequencies of the modes towards the higher values and to introduce the Alfven resonant layers inside the plasma. The consideration of the finite axial wave numbers increases the number of modes very rapidly. Finally it is shown that the important frequency shift of the mode frequencies is caused by the influence of the boundary vacuum layers. Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N79-33066 Pennsylvania Univ., Philadelphia.
STARK MODULATION SPECTROSCOPY OF MOLECULAR CRYSTALS Ph.D. Thesis
Charles Michael Klimcak 1979 157 p
Avail: Univ. Microfilms Order No. 7919478

The Stark effect on the electronic absorption spectra of pure and mixed molecular crystals at 1.6 K were used to measure properties of the excited state charge distribution in a number of pi-electron molecules. The field induced shifts, splittings, and intensifications were determined from difference spectra by both computer simulation and moment analysis of the modulation lineshape. Results include: (1) spectra of pyridine in benzene showed the molecules to be oriented with their c sub 2 nearly parallel to the benzene C-H bond direction closest to the crystallographic b axis; (2) a Stark effect observed spectrum of the nitrate ion in a pure crystal of sodium nitrate indicated that the ion does not remain planar in the excited state; and excited state polarizabilities computed from observed Stark shifts of anthracene in naphthalene and exact point dipole treatments of the local field are not in agreement with those obtained from noncrystaline media, possibly due to failure of the point dipole approximation. Dissert. Abstr.

N79-33067 Notre Dame Univ., Ind.
ALLOWED AND FORBIDDEN TRANSITIONS IN METALLIC FERROMAGNETICS AND FERRIMAGNETS Ph.D. Thesis
Joseph Genero Sylvester 1979 170 p
Avail: Univ. Microfilms Order No. 7919959

Magnetoelastic excitations in ferromagnetic erbium, dysprosium, terbium, YFe2, and ferrimagnetic GdFe2 were studied using pulse-echo techniques at 5.7 and 9.0 GHz. The specimens were polycrystalline films, except for YFe2 and GdFe2 for which both polycrystalline and amorphous films were studied. The magneltoelastic signal intensities were studied as a function of the magnitude and orientation of the applied magnetic fields, temperature, and input power to the sample-bearing microwave cavity. Microwave absorption data were also obtained as a function of applied field for the various field configurations. A comprehensive study of the temperature dependence of multiple absorption peaks observed in GdFe2 was undertaken. Dissert. Abstr.

N79-33068 California Inst. of Tech., Pasadena.
HORIZONTAL BLOCH LINE MOTION IN MAGNETIC BUBBLE MATERIALS Ph.D. Thesis
Bruce Edward MacNeal 1979 190 p
Avail: Univ. Microfilms Order No. 7919853

The experimental and theoretical knowledge of horizontal Bloch line (HBL) motion in magnetic bubble materials is evaluated. The present theory of HBL motion is reviewed and extended to include transient effects in which the internal domain wall structure changes with time. This is accomplished by numerically solving the equations of motion for the internal azimuthal angle phi and the wall position q as functions of z, the coordinate perpendicular to the thin film material, and time. The effects of HBL's on domain wall motion are investigated by comparing results from wall oscillation experiments with those from the theory. In these experiments, a bias field pulse is used to make a step change in equilibrium position of either bubble or strip domain walls, and the wall response is measured by using transient photography. Dissert. Abstr.

N79-33069 City Univ. of New York, N. Y.
STUDY OF THE INHOMOGENEOUS ELECTRON GAS AT SURFACES Ph.D. Thesis
Cheng-Quinn Ma 1979 204 p
Avail: Univ. Microfilms Order No. 7916988

The system of an interacting neutrally charged electron gas at a jellium surface is studied over a wide range of densities including those for the metallic range. Both the fully correlated as well as the inhomogeneous Hartree-Fock gas are examined. The applicability of a variational formalism for the density to the inhomogeneous many body problem at surfaces is demonstrated and certain aspects of the density functional formalism are investigated for density profiles such as those existing at surfaces. The properties determined are the electronic density, surface dipole barriers, work functions, electrostatic potentials, and surface energies. Dissert. Abstr.

N79-33070 California Inst. of Tech., Pasadena.
SPUTTERING OF INSULATORS IN THE ELECTRONIC STOPPING REGION Ph.D. Thesis
Joseph Edward Griffith 1979 197 p
Avail: Univ. Microfilms Order No. 7919850

Using track detectors, sputtering yields induced by MeV light ions incident on a uranium containing glass, UO2, and UF4 were measured. No deviation from the behavior predicted by the Sigmund theory was detected in the glass or the UO2. The same was true for UF4 bombarded with He-4 at 1 Mev and with O-16 and Ne-20 at 100 KeV. In contrast to this, 4.75 MeV F-19 (+2) sputters uranium from UF4 with a yield of 5.6 + or - 1.0, which is about 3 orders of magnitude larger than expected from the Sigmund theory. The energy dependence of the yield indicates that it is generated by electronic rather than nuclear stopping processes. The yield depends on the charge state of the incident fluorine but not on the target temperature. Also measured was the energy spectrum of the uranium sputtered from the UF 4. Ion explosions, thermal spikes, chemical rearrangement and induced desorption are considered as possible explanations for the anomalous yields. Dissert. Abstr.

N79-33071 Texas Univ. at Austin.
A THEORETICAL AND EXPERIMENTAL STUDY OF THE THERMAL PROPERTIES OF XENON ADSORBED ON GRAPHITE Ph.D. Thesis
Eric Pierre DeRouffignac 1979 266 p
Avail: Univ. Microfilms Order No. 7920103

A model of the graphite crystal structure is discussed as well as the dynamics of a Xenon monolayer adsorbed on the (001) surface of graphite. A precision differential calorimeter was developed to measure the heat capacity of gases adsorbed on substrates with a large surface area (> sq m/g). The instrument incorporates NASA super insulation material which allows slow variation of the temperature of the system as a result of the thermal inertia of a thick copper shield, thus requiring no elaborate temperature control. The temperature difference between the sample cells is monitored with quartz crystal thermometers. The apparatus is capable of stability to better than 0.001 K over several hours and can give values for heat capacities of an adsorbed layer with better than 5% reproducibility. The heat capacity of Xenon adsorbed on graphitized carbon black was measured in the range 60 K to 120 K. Dissert. Abstr.

N79-33072 Carnegie-Mellon Univ., Pittsburgh, Pa.
THEORY OF PHASE TRANSITIONS IN GASES ADSORBED ON SOLIDS Ph.D. Thesis
Mario Jose DeOliveira 1979 135 p
Avail: Univ. Microfilms Order No. 7919138

A system of classical particles adsorbed on a flat surface is studied, in the multiple layer regime, by the mean field approximation of a lattice-gas model, and, in the monolayer regime, by the harmonic approximation and the Monte Carlo method. The phase diagram for the lattice-gas model shows an infinite number of first-order transitions, each terminating in its own critical point as the temperature increases. Other related models are discussed and it is argue that the roughening transition might be relevant to multiple layer adsorption. The surface tension of the lattice-gas, or Ising model, is calculated. A portion of the phase diagram for a two dimensional system of classical particles interacting with the Lennard-Jones potential is constructed. Dissert. Abstr.

N79-33073 Rice Univ., Houston, Tex.
ULTRASONIC GENERATION IN THIN FILMS OF TbFe2 Ph.D. Thesis
Walter Leslie Wimbush 1978 167 p
Avail: Univ. Microfilms Order No. 7919645

Ultrasonic elastic waves were generated in thin films of terbium iron. The thin films of TbFe2 were prepared by vacuum evaporation onto crystalline quartz substrates. The films were observed to possess a strong magnetic anisotropy with the easy axis of magnetization perpendicular to the plane of the film. Hysteresis curves were obtained using a P.A.R. vibrating sample magnetometer. The magnetization data indicated magnetic remanence as high as 90% with saturation and coercive forces as large as 10 kOe. These films retained 90% of their maximum ultrasonic production in the absence of an external dc biasing field. An investigation into the effects of a perpendicular magnetic field during deposition is discussed as well as the effects of an externally applied stress on the film. A theoretical fit to the experimental data was obtained using a Green's Function approach to the magnetoelastic generation within the film.
Dissert. Abstr.

N79-33074 State Univ. of New York at Albany.
PSEUDOPOTENTIAL METHODS IN THE CALCULATION OF ELECTRONIC PROPERTIES AND QUADRUPOLE INTERACTIONS IN METALS Ph.D. Thesis
Michael Donald Thompson 1979 251 p
Avail: Univ. Microfilms Order No. 7918825

Calculation of the energy band structure in indium using an ab initio pseudopotential and a simple model potential shows fairly good agreement between the two methods. A rough calculation of the density of states in indium is also presented. The quadrupole interaction in metals is addressed. Applications of the two types of pseudopotential and the model potential were made to the calculation of this property which is extremely sensitive to the details of the charge distribution in a metal. The calculation of the electric field gradient at impurity sites in metals, where important effects due to orthogonalization of the band states to the impurity cores is found, is dicussed. The effect of a finite concentration of impurities on the electric field gradient at both host and impurity sites was calculated. The relationship of these results to experiment is discussed.
Dissert. Abstr.

N79-33075 Tulane Univ., New Orleans, La.
PLANAR DEFORMATION OF GRANULAR MATERIALS Ph.D. Thesis
Morteza Mirzaie Mehrabadi 1979 93 p
Avail: Univ. Microfilms Order No. 792C400

A theoretical study of the planar deformation of dilatant granular materials is presented. The sliding deformation models for the post-failure behavior of granular materials are extended to include dilatancy. The properties of the dilatant sliding drformation model include coincidence of the stress and velocity characteristics, realistic energy dissipation prediction and, in general, non-coincidence of the principal axes of stress and strain-rate. A boundary value problem employing the constitutive relations of the dilatant sliding deformation model is considered. This is the problem of radial flow of dilatant cohesionless granular materials in wedge-shaped channels. The angle of internal friction is assumed to be a constant and the coefficient of dilatancy is assumed to vary with pressure and density. Dissert. Abstr.

N79-33076 Notre Dame Univ., Ind.
AN INVESTIGATION OF FACTORS AFFECTING THE SEMICONDUCTOR-TO-METAL TRANSITION OF V(1-x)W(x)O(2) Ph.D. Thesis
Howell George Henry 1979 136 p
Avail: Univ. Microfilms Order No. 7919945

The x-value of the crystals was measured directly via Energy Dispersive X-Ray Spectroscopy (EDS) and compared to that of the powder from which they were grown. In every case, the EDS-measured value was lower. Crystals grown with lesser amounts of TeCl4 were smaller but had higher x-values and displayed more ideal semiconductor-to-metal conductivity transitions. Treatment of V(1-x)W(x)O2 crystals for 18 hours in a CO2/O2 atmosphere at 1170 C decreased their transition temperature by an amount directly proportional to the partial pressure of O2. Similar treatment of VO2 also decreased the transition temperature, but at a lower rate. The ambient temperature at which the crystals exhibited the transition was observed to decrease as the electrical current through them increased. Dissert. Abstr.

N79-33077 Rice Univ., Houston, Tex.
CORRELATION BETWEEN THE KINETIC AND THERMODYNAMIC PROPERTIES OF INTERSTITIAL SOLID SOLUTIONS Ph.D. Thesis
Raymond John Farraro 1979 88 p
Avail: Univ. Microfilms Order No. 7919581

Recent evidence for non-Arrhenius diffusion behavior of heavy interstitials (oxygen and nitrogen) in the group V transition metals is discussed. Several models for this behavior are examined in light of recent elastic measurements and new high temperature thermodynamic measurements in the Mo-N system. A first order statistical model for Fe-based ternary solutions containing a substitutional and an interstitial solute is presented. The model is used to calculate the variation of the diffusivity of the interstitial species with the concentration of substitutional solute. It is shown that when there is virtually no misfit energy the energetics of solution formation are largely determined by electronegativity differences. The role is examined of volume effects on the thermodynamics of solid solution formation. These effects are discussed in relation to newly completed elastic measurements in Pd-H solutions. Dissert. Abstr.

N79-33078 State Univ. of New York at Stony Brook.
DEFORMATION TWINNING AND ITS ROLE IN THE CAVITATION EROSION RESPONSE OF HCP Co SINGLE CRYSTALS Ph.D. Thesis
Sheila Prasad 1979 175 p
Avail: Univ. Microfilms Order No. 7919355

Ultrasonic cavitation was ultilized in simulating erosion damage in HCP Co single crystals and the deformation characteristics contributing to its superior erosion resistance determined. In the early stages of damage, a homogeneous distribution of <(-2)110> and <2(-1)(-1)0> glide is observed in crystals in the (0(-1)10) orientation. However, the slip distribution in (0001) crystals is much more heterogeneous and comprised of mainly dislocations. This variations in glide structure is reflected in their subsequent twinning response. Although the imposed high strain rate together with the complex stress pattern activates a variety of twinning systems, the (0(-1)10) specimens develop a high density of /11(-2)1/ twins, whereas the (0001) specimens deform predominantly by /10(-1)2/ twinning. The twin structure in (0(-1)10) crystals is finer and more needle like than that in (0001) crystals. The erosion properties of crystals in the (0(-1)10) orientation are also superior to those of (0001) crystals.
Dissert. Abstr.

N79-33079# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
THE RESPONSE OF GERMANIUM TO LARGE AMPLITUDE SHOCK WAVES
Paul Harris Jun. 1979 38 p refs
(AD-A070454; AD-E400317; ARLCD-TR-79016) Avail: NTIS HC A03/MF A01 CSCL 20/12

A tentative explanation for the first two (50 kb and 120 kb) experimentally observed shock wave transitions in single crystal germanium is presented. Calculations are carried out which suggest that the 120 kb transition is associated with the ductile yielding upon collapse of the conduction band onto the valence band (i.e., a semiconductor-metal transition without an associated transformation of the crystal structure). Arguments are also given which lead to the identification of the 50 kb transition as a brittle fracture phenomenon. GRA

N79-33080# Minnesota Univ., Minneapolis. Dept. of Electrical Engineering.
A STUDY OF FLICKER NOISE IN MOSFETS Final Report, 16 Jun. 1972 - 15 Mar. 1979
A. Vanderziel Jun. 1979 12 p refs
(Grants DA-ARO(D)-31-124-72-G121; DAHC04-74-G-0199; DAHC04-75-G-0151; DAAG29-77-G-0106)
(AD-A070313; ARO-10298.9-EL; ARO-12988.2-EL; ARO-14273.15-EL) Avail: NTIS HC A02/MF A01 CSCL 20/12

Considerable progress was made in two areas: (1) Better understanding of flicker noise in MOSFETs. (2) Better understanding of hot electron noise in JFETs. In addition, considerable clarification was obtained in the understanding of flicker noise problems in general. This report summarizes the research efforts in the above areas. Author (GRA)

N79-33081# Nebraska Univ., Lincoln. Dept. of Electrical Engineering.

ELECTRICAL PROPERTIES OF THIN GaAs FILMS DEPOSITED BY SPUTTERING Final Report, 1 Oct. 1976 - 31 Mar. 1979

31 May 1979 68 p refs

(Grant AF-AFOSR-3155-77; AF Proj. 2306)

(AD-A070017; AFOSR-79-0724TR) Avail: NTIS HC A04/MF A01 CSCL 20/12

Thin GaAs films have been deposited by sputtering with co-sputtering of As and impurity targets. These films have been deposited onto n-type GaAs substrates for Schottky barrier measurements and Cr-doped semi-insulating substrates for conductivity and Hall effect measurements. The measurements on Schottky barriers formed by deposition of aluminum contacts onto the films of GaAs indicated that the simple Schottky barrier model does not hold for these films. An analysis of the capacitance-voltage characteristics of this device is presented and leads to a small signal model consisting of two parallel RC circuits in series. Further analysis of this circuit results in a determination of the electrical properties of the thin films. GRA

N79-33082# Westinghouse Research and Development Center, Pittsburgh, Pa.

GaAs/AlGaAs HERTEROJUNCTION GATE FIELD EFFECT TRANSISTOR Final Report

J. G. Oakes, V. L. Wrick, and R. A. Wickstrom Aug. 1978 53 p refs

(Contract N00014-76-C-0735; RF54581001)

(AD-A070081; Rept-78-9F7-HETRO-R1) Avail: NTIS HC A04/MF A01 CSCL 09/1

An enhancement mode junction field effect transistor (JFET) using an Al(x)Ga(l-x)As gate and a GaAs channel was designed and fabricated in an attempt to establish a GaAs logic technology base permitting 'direct' coupling without the necessity for level shifting, while at the same time, permitting a wider dynamic range (noise margin) due to the larger anticipated built-in voltage of the heterojunction gate. The heterojunction layers were grown by liquid phase epitaxy (LPE). Although the control of doping level and morphology was good, the GaAs layers were thicker than necessary, resulting in some depletion mode action by the JFET. The high forward biased gate voltage of these devices, 2-3 volts, was the result of a rectifying contact on the p-type Al(x)Ga(l-x)As and not due to the anticipated larger work function difference. The devices showed a cut-off frequency, f(max), of 1.5 GHz. Author (GRA)

N79-33083# Hughes Research Labs., Malibu, Calif.

WIDE BANDWIDTH LIQUID CRYSTAL LIGHT VALVE Final Report, 31 May - 30 Oct. 1978

P. Braatz, M. Little, V. Efron, and J. Grinberg May 1979 94 p refs

(Contract DAAK70-78-C-0100)

(AD-A070675) Avail: NTIS HC A05/MF A01 CSCL 20/6

During this contract, we accomplished the following major tasks toward the development of a CCD liquid-crystal light valve. We have demonstrated a fully operational CCD LCLV with a contrast ratio of 50:1 and a spatial resolution of 12 lines across the device. An alternative chip dicing method has been developed that reduces degradation to the substrate by a factor of 100. In addition, a new CCD LCLV packaging technique has been developed that improves the light valve fabrication yield from 30% to 80%. GRA

N79-33084# California Univ., Los Angeles. Dept. of Chemistry.

OPTICAL DETECTION OF SPECTRAL DIFFUSION OF THE TRIPLET STATE ZEROFIELD TRANSITION ENERGY

William M. Pitts and M. A. El-Sayed Jul. 1979 36 p refs

(Contract N00014-75-C-0602)

(AD-A071179; TR-35) Avail: NTIS HC A03/MF A01 CSCL 20/10

Pulsed EEDOR experiments using optical detection have been developed and utilized to study spectral diffusion within the inhomogeneously broadened zerofield spin transition of a photoexcited triplet molecule. Two distinct spectral diffusion processes have been observed. One is very fast and is the source of the rapid loss of spin coherence previously observed in spin echo experiments of photoexcited triplet molecules. This rapid spectral diffusion seems to be limited to a narrow range of frequencies within the inhomogeneous profile of the spin transition. The second phase is considerably slower, but can sample a greater range of frequencies within the inhomogeneous profile. This second spin diffusion process determines the minimum hole width which can be observed in a steady state EEDOR experiment. GRA

N79-33085# Crystal Specialties, Inc., Monrovia, Calif.

STUDY CZOCHRALSKI LIQUID-SEAL CRYSTAL GROWING TECHNIQUE Final Report

John K. Kennedy and Worth P. Allred Griffiss AFB, N. Y. RADC Apr. 1979 28 p refs

(Contract F19628-76-C-0118)

(AD-A070280; RADC-TR-79-86) Avail: NTIS HC A03/MF A01 CSCL 20/2

N-Type, P-Type and semi-insulating (Chrome dope) single crystals of Gallium Arsenide were grown using the Czochralski Liquid-Seal Technique. Boron Nitride was selected as the crucible material that would yield the best quality single crystals. Single Gallium Arsenide crystals of up to 300 grams were grown as a result of modifications made in the puller apparatus. Experiments were conducted to identify the cause of impurity contamination during the growth process. The results of these experiments indicated that: 1) The introduction of Boron Oxide (B2O3) to the Gallium Arsenide melt absorbed impurities. 2) Silicon (Si) was being introduced to the melt by the breakdown of the quartz (2SiO2 2SiO-O2). This was caused by the natural gas-oxygen torch, which heats the quartz chamber to prevent Gallium Arsenide condensation. 3) A special viewport, heated by a resistance furnace rather than a natural gas-oxygen torch was used to reduce silicon contaminants. As a result of this experiment, an undoped semi-insulating crystal of extremely high purity was grown. GRA

N79-33086# Maryland Univ., College Park. Dept. of Physics and Astronomy.

INVESTIGATION OF NOISE IN SOILDS AT LOW TEMPERATURES Annual Report

William S. Davis, H. J. Paik, J. P. Richard, K. Krack, and J. Weber Apr. 1979 84 p refs

(Contract F49620-77-C-0065)

(AD-A070016; AFOSR-79-0693TR) Avail: NTIS HC A05/MF A01 CSCL 20/2

The theory of the noise which limits the measurements of strains in solids is presented. Measurements of quality factors of nearly perfect crystals are summarized together with the status of the development of procedures for observing the noise of very high quality factor crystals at low temperatures. Design calculations for a large 20 millikelvin cryostat are presented. GRA

N79-33087# Illinois Univ. at Urbana-Champaign. Dept. of Electrical Engineering.

THE STUDY AND IDENTIFICATION OF RESIDUAL DONOR SPECIES IN HIGH PURITY SEMICONDUCTORS Final Report, 1 Jun. 1978 - 31 May 1979

Gregory E. Stillman May 1979 24 p refs

(Contract N00173-78-C-0129)

(AD-A071059; UILU-ENG-79-2553) Avail: NTIS HC A02/MF A01 CSCL 20/12

A Fourier transform spectroscopy apparatus has been constructed. This apparatus uses photothermal ionization to probe the energy level structure of shallow impurities in semiconductors. The present form of the apparatus, and progress made in modifying it to increase its resolution are described in detail. An account of our immediate and possible future applications of the apparatus is given. GRA

N79-33088# Colorado State Univ., Fort Collins. Dept. of Physics.
RADIATIVE TRANSITIONS INDUCED IN GaAs BY MODEST HEAT TREATMENT
Huelya Birey and James Sites Apr. 1979 27 p
(Contract N00014-76-C-0976; RR0210203)
(AD-A071039; SF20) Avail: NTIS HC A03/MF A01 CSCL 20/12

Photoluminescence studies were made on three species of GaAs as a function of annealing time. The evolution of the spectra were carefully monitored and interpreted in terms of the creation of arsenic vacancies at the surface. GRA

N79-33089# RCA Labs., Princeton, N. J.
EPITAXIAL GROWTH OF SEMI-INSULATING GaAs Interim Report, 1 Jul. 1978 - 31 Mar. 1979
S. T. Jolly, E. C. Douglas, S. G. Liu, C. P. Wu, and Y. H. Yun May 1979 59 p refs
(Contract N00014-77-C-0542; DARPA Order 3441)
(AD-A071166; PRRL-79-CR-20) Avail: NTIS HC A04/MF A01 CSCL 20/2

The objectives of this program are to (1) develop techniques for the epitaxial growth of high-resistivity buffer layers on semi-insulating (SI) GaAs substrates, (2) investigate ion implantation of donors into GaAs over a range of 50 to 2000 keV, and (3) investigate the potential of laser annealing to remove lattice damage caused by ion implantation and to activate the implanted donors. Preliminary results on growth of Cr-doped buffer layers by vapor-phase epitaxy (VPE) were described in our previous report. These Cr-doped layers were grown using the Ga/HCl/AsH3/H2 system. Based on these results specifications for a new semi-automatic gas-handling system were developed and the unit purchased from Crystal Specialties. GRA

N79-33090# National Bureau of Standards, Washington, D. C. Polymer Science and Standards Div.
FABRICATION OF PIEZOELECTRIC POLYMER FILM
James M. Kenney, Steven C. Roth, and Martin G. Broadhurst Sep. 1978 28 p refs Submitted for publication
(Contract N00014-79-C-0012)
(AD-A070822; TR-12) Avail: NTIS HC A03/MF A01 CSCL 20/3

High values of pyroelectric and piezoelectric activity in fully electroded films of poly(vinylidene fluoride) were obtained by 'conventional' (non-corona) poling at room temperature with sufficiently high fields. The avoidance of breakdown while obtaining high activity requires an understanding of the time dependence of both breakdown and activity. Time-to-breakdown as a function of field, and room temperature pyroelectric activity (7-14 days after poling at 23-1/2 C) as a function of poling time and field were obtained for 25 micrometer biaxially stretched films with evaporated aluminum electrodes. The highest activities were obtained by poling at the highest fields and poling to breakdown. A pyroelectric activity of 36/micro-CK sq m was measured two weeks after poling. The highest activity obtained with no apparent breakdown (31/micro-CK sq m) was measured a week after poling. These values are comparable with the highest that have been reported for this material using any poling temperature or using corona poling. GRA

N79-33091# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ORIENTATION OF CRYSTALLINE OVERLAYERS ON AMORPHOUS SUBSTRATES BY ARTIFICIALLY PRODUCED SURFACE RELIEF STRUCTURES
Dale C. Flanders 5 Dec. 1978 112 p refs
(Contract F19628-78-C-0002; ARPA Order 3336)
(AD-A071168; TR-533; ESD-TR-78-294) Avail: NTIS HC A06/MF A01 CSCL 20/2

A new method of orienting crystalline (anisotropic) overlayers on an amorphous substrate by surface relief structures on the substrate has been analyzed and demonstrated. New submicrometer fabrication techniques has to be developed in order to demonstrate the orientation effect. These techniques may have broad application in the field of microelectronics and integrated optics as well as in the work presented here. It is believed that the models and demonstrations of overlayer orientation presented here are but a first step in what will be an exciting new field of investigation. In essence, a new degree of freedom has been introduced in the science and technology of surfaces and thin-film growth. GRA

N79-33092# Ames Lab., Iowa.
KINETIC MODELS FOR IRREVERSIBLE PROCESSES ON A LATTICE Ph.D. Thesis
Nicholas Owen Wolf Apr. 1979 225 p refs
(Contract W-7405-eng-82)
(IS-T-850) Avail: NTIS HC A10/MF A01

A brief overview of kinetic lattice model formalisms and an extensive literature survey are presented along with a review of the kinetic models for noncooperative lattice events. The development of cooperative lattice models and solution of the resulting kinetic equations for an infinite and a semi-infinite lattice are thoroughly discussed. The cooperative models are then applied to the problem of theoretically determining the sticking coefficient for molecular chemisorption. Other possible applications of these models and several model generalizations are considered. Results of an experimental study directed toward elucidating the mechanistic factors influencing the chemisorption of methane on single crystal tungsten are reported. DOE

N79-33093# Oak Ridge National Lab., Tenn.
NEW MATERIALS PROPERTIES ACHIEVABLE BY ION IMPLANTATION DOPING AND LASER PROCESSING
B. R. Appleton, B. C. Larson, C. W. White, J. Narayan, S. R. Wilson, and P. P. Pronko Dec. 1978 9 p refs Presented at Ann. Meeting of Materials Res. Soc., Boston, 28 Nov. 1978
(Contract W-7405-eng-26)
(CONF-781121-22) Avail: NTIS HC A02/MF A01

Ion implantation techniques used to introduce selected impurities into solids in a controlled accurate manner are described. Experiments show that pulsed laser processing of materials leads to surface melting, dopant redistribution and crystal regrowth, all on extremely short time scales. These two processes are combined to achieve properties not possible with normal materials preparation techniques, or in altering materials properties in a more efficient manner. The combined techniques of positive ion scattering channeling, X-ray scattering, and transmission electron microscopy show that supersaturated alloys are formed in the surface regions of ion implanted, laser annealed silicon single crystals, and that these surfaces undergo a unique one dimensional lattice contraction or expansion depending on the dopant species. DOE

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N79-33094 Rice Univ., Houston, Tex.
THE ROLE OF STRUCTURE IN DETERMINING THE THERMODYNAMIC PROPERTIES OF HOMOGENEOUS FLUID MIXTURES Ph.D. Thesis
Joseph Benedict Gonsalves 1979 134 p
Avail: Univ. Microfilms Order No. 7919585

The radial distribution functions for pairs in a homogeneous fluid mixture are closely approximated from known data on pair distribution functions for pure components evaluated at a mean density determined by a properly defined average of molecular interaction parameters in the mixture. In/sight into the structure of a mixture is gained, thus the term structure is gained, thus meaning a description of the probability of finding a molecule of a given species at a given separation from that of another molecule. The mean density approximation is used to replace the assumption about structure in mixtures inherent in the traditional regular solution theory. The result is a modified regular solution theory which gives an improvement in predicting excess thermodynamic functions and activity coefficients in mixtures involving appreciable differences in molecular size and shape.
Dissert. Abstr.

N79-33095 Pennsylvania Univ., Philadelphia.
STATISTICAL THERMODYNAMICS OF SORPTION IN MOLECULAR SIEVES Ph.D. Thesis
Jorge Luis Soto 1979 201 p
Avail: Univ. Microfilms Order No. 7919517

The behavior of sorbate molecules in zeolite cavities was studied. A theory which takes into account both dispersion and electrostatic energies was developed to calculate Henry's constant for sorption of gases in molecular sieves. The Lennard-Jones and Devonshire (LJD) theory of liquids is modified to calculate the contributions due to dispersion forces. Comparison of the theory with experimental data shows that the dispersion forces and electrostatic forces are of the same order of magnitude, even for nonpolar molecules, and that the cavity is energetically heterogeneous. Adsorption isotherms, heats of adsorption and radial distribution functions for hard sphere and Lennard-Jones molecules in a MS-13X cavity were generated by a Monte Carlo simulation of the grand canonical ensemble. The gas-solid potential energy was calculated using the theory proposed for the Henry's constant. Heterogeneity and cooperative forces were found to be equally important in determining the adsorptive properties, and neither effect predominates. Dissert. Abstr.

N79-33096# Brown Univ., Providence, R. I. Div. of Engineering.
THERMODYNAMIC AND TRANSPORT PROPERTIES OF ISOBUTANE: A SURVEY OF AVAILABLE DATA
J. Kestin, H. E. Khalifa, and B. Kumar Nov. 1978 204 p refs
(Contract EY-76-S-02-4051)
(COO-4051-35; CATMEC/27) Avail: NTIS HC A10/MF A01

An extensive compilation of the available equilibrium and transport properties of isobutane (2-methyl propane) is presented. Also, the available correlations of the thermodynamic properties of isobutane are listed; the statement is made that these correlations do not agree among themselves, and that none is obviously superior to the others. The compilation of available experimental data on equilibrium properties (up to 1978) is preparatory step towards the formulation of a new, more accurate correlation as an aid for design of geothermal installations. DOE

N79-33097# California Univ., Livermore. Lawrence Livermore Lab.
DESIGN AND ANALYSIS OF ISENTROPIC COMPRESSION EXPERIMENTS
R. S. Hawke 7 May 1979 23 p refs Presented at the 2d Intern. Conf. on Megagauss Magnetic Field Generation and Related Topics, Rosslyn, Va., 29 May - 1 Jun. 1979
(Contract W-7405-eng-48)
(UCRL-81797; Conf-790540-4) Avail: NTIS HC A02/MF A01

The use of magnetic flux compression to isentropically compress matter is summarized. The process used to extract boundary data from the flash radiographs and the design criteria for the containment of very compressible material are described. Suggestions for improvement of the next generation of experiments are made. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N79-33098# General Accounting Office, Washington, D. C. Procurement and Systems Acquisition Div.
THE MULTINATIONAL F-16 AIRCRAFT PROGRAM: ITS PROGRESS AND CONCERN
25 Jun. 1979 43 p
(PB-296999/6; PSAD-79-63) Avail: NTIS HC A03/MF A01 CSCL 01C

The multinational F-16 aircraft program created complex tasks previously not present in acquiring U.S. aircraft. These include being able to meet the U.S. coproduction offset commitment, taking actions to keep the international production program on schedule, integrating U.S. procurement regulations and foreign operations, controlling currency exchange activity, and establishing a multinational reliability warranty program. To improve program management of the F-16 and future coproduction efforts, GAO recommends cost sharing of engineering changes, estimation of the cost impact of coproduction, and consistent loadings (overhead) allocation. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N79-33099 Stanford Univ., Calif.
THE INTEGRATED COMPUTER DATABASE AS A MEDIUM FOR THE MANAGEMENT AND ACCESS OF TEXTUAL INFORMATION Ph.D. Thesis
Jesse Michael Caton 1978 297 p
Avail: Univ. Microfilms Order No. 7808771

The design, implementation, application, and evaluation of a system for the computer-based management of textual information with emphasis on the particular problems encountered in developing responsive computer documentation systems are presented. Dissert. Abstr.

N79-33100 Pittsburgh Univ., Pa.
AN AUTOMATED THESAURUS CONSTRUCTION BASED ON A DISTANCE MEASUREMENT BETWEEN KEYWORDS Ph.D. Thesis
Boaz Lazinger 1977 74 p
Avail: Univ. Microfilms Order No. 7809122

A method for generating an automated thesaurus for information retrieval systems is proposed. A proximity measure for terms relation is introduced as input to a multidimensional scaling procedure, which transforms a set of terms into a semantic space with a metric distance between them. The coordinates of the terms are then processed through a clustering analysis program which amalgamates the terms into clusters according to the criterion of minimal distance. The result is a hierarchical network of terms which have a high probability of appearing in a close area of the database they were taken from. Such a thesaurus has an advantage over a regular thesaurus (such as ERIC), since it gives the user a reflection of the data-base, which helps him to formulate a more precise search profile. Dissert. Abstr.

N79-33101# General Electric Co., Philadelphia, Pa. Space Division/Space Sciences Lab.
A GUIDE AND HANDBOOK FOR USING THE GE SPACE/RESD LIBRARIES
Larry Chasen 9 Sep. 1979 57 p
(DOC-79SDS030) Avail: MF NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 HC GE, Space and RESD Libraries, P.O. Box 8555, Philadelphia, Pa. 19101 $25.00

A detailed description of services of the Space/RESD Div. Libraries is offered. Of interest to the library user is how to order material, the scope of the Library's collection, subscription services, and use of the card catalogs, for both documents, books and journals. Of specific need is to acquaint engineers and scientists with the multiple On-Line Information Systems services available, such as DDC, NASA/RECON, DOE/RECON and the DIALOG Information system. Author

N79-33102# Oak Ridge National Lab., Tenn.
USER'S GUIDE TO PROGRAM MAD: A COMPUTER PROGRAM FOR THE ORGANIZATION AND MANIPULATION OF MAGNETIC TAPE DIRECTORIES
W. H. Gray May 1979 39 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6597) Avail: NTIS HC A03/MF A01

MAD is a computer program for the organization and manipulation of the information contained in magnetic tape directories. Program MAD creates, updates, and interrogates a set of four random access files collectively called the MAD unified data base. Although program MAD was originally intended as an information compression mechanism, it has evolved into an organization system with the added feature of an approximately 60% reduction in the space required to store the data. This program is easy to use, relatively fast, efficient in its use of disk space, and available to all users of the Fusion Energy Division DECsystem-10. DOE

N79-33103# California Univ., Livermore. Lawrence Livermore Lab.
ARCHIVAL STORAGE REQUIREMENTS
George A. Michael 22 Mar. 1979 7 p refs Presented at the SPIE Symp., Washington, D. C., 18 Apr. 1979
(Contract W-7405-eng-48)
(UCRL-82513; Conf-790448-3) Avail: NTIS HC A02/MF A01

The Lawrence Livermore Laboratory has a decade of experience with the use of an archival computer storage facility. A continuing need is seen for such capabilities at the Department of Energy laboratories. This need arises from the increased speeds of large computers and from their proliferation as well. Surveys of potential sources suggest that the soonest and likeliest possibilities for developing an archival storage system are offered by optical technologies. The requirements for such a facility are briefly discussed. DOE

N79-33104# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
ON SEARCH PERFORMANCE FOR CONJUNCTIVE QUERIES IN COMPRESSED, FULLY TRANSPOSED ORDERED FILES
Per Svensson (Res. Inst. of Natl. Defence) 1979 19 p refs
(TRITA-NA-79-08) Avail: NTIS HC A02/MF A01

A file organization method, providing very high performance for a large class of associative queries, is abstractly defined. The organization may be viewed both as a development of the fully transposed file, and as a generalized sort. Its average search performance is modeled under some simplifying assumptions. Also, the model predictions are compared with measurement results obtained from a prototype system and a qualitative agreement is found. For purposes of comparison, analytical and measured cost curves for fully transposed file search are also given. Author (ESA)

N79-33105# Gull (Cloyd Dake) and Associates, Inc., Kensington, Md.
NATIONAL PERIODICALS CENTER CONCEPT RECONSIDERED: ALTERNATIVES AND COSTS
Cloyd Dake Gull 4 Apr. 1979 31 p
(PB-296351/0) Avail: NTIS HC A03/MF A01 CSCL 05B

The National Commission on Libraries and Information Science adopted the concept of a National Periodicals Center with a dedicated collection in 1977 and held an Open Forum on it in March 1979. An expanded version of the author's presentation at the Open Forum is presented. It offers the view that the systems analysis and design effort was inadequate for NCLIS to adopt the concept of NPC&C because no real effort was made to propose alternative solutions to the problems of periodical access for American users, thus preventing any cost or service comparisons of two or more alternatives. It recommends that NCLIS admit its adoption was premature and that NCLIS act to repair the deficiencies and it offers a new approach to developing alternative solutions. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N79-33106# National Swedish Road and Traffic Research Inst., Linkoeping.
CHEMICAL DE-ICING OF ROADS: THE EFFECT ON ROAD ACCIDENTS
Kjell Andersson 1978 51 p refs In SWEDISH; ENGLISH summary
(VTI-145) Avail: NTIS HC A04/MF A01

Three attempts to trace the effects of chemical deicing methods (salting) on traffic accidents are reported. Only police reported accidents on national roads during the winter are taken into account without distinction as to severity. An analysis of variance conducted between 1970 and 1974 does not show that salting effects the total number of accidents. Another analysis based on the road conditions in the winter of 1973 shows that on ice/snow the accident rate is 3 to 20 times higher than on dry ground, but this rate increases under light ice/snow conditions due to a surprise factor. A before-after study conducted in 1972 through 1973 and 1974 through 1975 on salted and unsalted roads shows that the accident rate is not changed by salting. However, as this is a nonexperimental study no firm conclusions can be drawn. Author (ESA)

N79-33107# Raytheon Co., Burlington, Mass.
TRANSPORTATION SYSTEMS CENTER BIBLIOGRAPHY OF TECHNICAL REPORTS
Janice A. Bilsback Mar. 1979 133 p
(PB-296342/9; DOT-TSC-RSPA-79-5) Avail: NTIS HC A07/MF A01 CSCL 01C

The bibliography lists unlimited distribution reports released by the Transportation Systems Center from January through December 1978. It supplements the Transportation Systems Center Bibliogrpahy of Technical Reports, July 1970 - December 1976 (DOT-TSC-OST-77-17) and January - December 1977 (DOT-TSC-OST-78-14). Reports are listed by sponsoring agency, and are indexed by subject, personal author, corporate author, title, contract number and report number. GRA

N79-33108# King Research, Inc., Rockville, Md.
JOURNAL IN SCIENTIFIC COMMUNICATION: THE ROLES OF AUTHORS, PUBLISHERS, LIBRARIES AND READERS IN A VITAL SYSTEM Final Report
Donald W. King, Dennis McDonald, and Nancy Roderer May 1979 432 p refs
(Grant NSF DSI-75-06942)

(PB-296263/7; KRI-9232-VI) Avail: NTIS HC A19/MF A01 CSCL 05B

The scientific and technical journal system in the United States is described. Data about authorship, publishing, libraries, abstracting and indexing, and reading of scientific and technical journals are included. The flow of information among the principal participants in this system is also discussed. Some data are derived from surveys of authors, publishers, abstracting and indexing services, and scientists and engineers (as readers). Substantial data are given on the cost of the entire system. Much of the data dates back to 1960 and is projected to 1985. GRA

N79-33109# Dynamic Science, Phoenix, Ariz.
PARATRANSIT VEHICLE TEST AND EVALUATION. VOLUME 2: ACCELERATION AND INTERIOR MEASUREMENT TESTS Final Report, Nov. 1976 - Aug. 1977
L. Wesson and C. Culley Jun. 1978 189 p
(Contract DOT-TSC-1241)
(PB-295476/6; UMTA-MA-06-0052-78-2;
DOT-TSC-UMTA-77-49-2) Avail: NTIS HC A09/MF A01 CSCL 13F

A series of tests and evaluations of two prototype vehicles for paratransit were conducted. This volume (Volume 2) presents the test procedure and results of the acceleration and interior measurement test series. The tests determined the acceleration characteristics of the vehicles, the effects of vehicle acceleration/deceleration on vehicle passengers, the effectiveness of wheelchair restraint systems, and the available interior space for the driver and passengers. Performance data of the prototypes are compared with those of two baseline test vehicles. GRA

N79-33110# Dynamic Science, Phoenix, Ariz.
PARATRANSIT VEHICLE TEST AND EVALUATION. VOLUME 5: NOISE TESTS Final Report, Nov. 1976 - Jul. 1977
L. Wesson, C. Culley, and R. L. Anderson Jun. 1978 57 p
(Contract DOT-TSC-1241)
(PB-295479/0; UMTA-MA-06-0052-78-5;
DOT-TSC-UMTA-77-49-5) Avail: NTIS HC A04/MF A01 CSCL 13F

The test procedures and results of the noise tests conducted on the two paratransit vehicles and the baseline test vehicle are presented. The test series measured external vehicle noise during acceleration, constant speed, and stationary at idle conditions. Interior noise at each of the passenger locations and in the driver's compartment was also measured under the above conditions. GRA

N79-33111# East-West Gateway Coordinating Council, St. Louis, Mo.
TRANSPORTATION SYSTEMS MANAGEMENT ELEMENT Final Report
L. Sterman, S. Schold, and B. Ferris Mar. 1979 112 p refs Sponsored by DOT
(PB-295349/5; EWG-LS-0377.10.0;
UMTA-MO-09-0014-79-1) Avail: NTIS HC A06/MF A01 CSCL 13B

Transportation Systems Management (TSM) denotes a process designed to increase the efficiency of existing transportation facilities and resources by implementing low-capital measures which reduce the need for major capital improvements. In addition to fiscal economy, the TSM process insures that meaningful steps can be taken toward attaining broader local and national goals, which include: energy conservation; environmental improvements; equity for transit dependents; and urban preservation. The TSM planning process in the St. Louis, Missouri region is documented. TSM goals and objectives, planning programs, projects and concepts, and project monitoring are included. GRA

N79-33112# Smith (Wilbur) and Associates, Washington, D. C.
CHARACTERISTICS OF URBAN TRANSPORTATION DEMAND; APPENDIX
Herbert S. Levinson Jan. 1979 213 p ref
(PB-294989/9; UMTA-IT-06-0049-79-2) Avail: NTIS HC A10/MF A01 CSCL 13B

Usable planning concepts constituting an addition to the set of computerized and manual techniques comprising the UMTA/FHWA Urban Transportation Planning System are presented. Data on individual cities, roads, routes, stations, etc., are given. These are not comparable from place to place, but are of interest from a historical perspective for the urban areas concerned. GRA

N79-33113# Transportation Systems Center, Cambridge, Mass.
PROCEEDINGS OF THE 4TH US-GERMAN URBAN TRANSPORTATION WORKSHOP
Sep. 1978 342 p refs In ENGLISH; partly in GERMAN Workshop held at Los Angeles, San Francisco, and Chicago, 15-25 Apr. 1978 Sponsored by Urban Mass Transportation Admin.
(PB-294972/5; UMTA-MA-06-0086-78-1) Avail: NTIS HC A15/MF A01 CSCL 13B

The workshops are held in alternate years in the Federal Republic of Germany and the United States on the basis of international agreements between the Federal Ministry of Transportation, the Federal Ministry of Research and Technology, and the U. S. Department of Transportation. The purpose of the workshops is to share experience and research findings relative to policy, finance, planning, management, operations, and technologies in the field of urban transportation. GRA

N79-33114# Washington Univ., Seattle. Dept. of Civil Engineering and Urban Planning.
ON-BOARD TRANSIT ORIGIN-DESTINATION SURVEY DATA: EXPANDING THEIR USE VIA ON-LINE DATA ACCESS AND ANALYSIS
Robert G. Shawcroft and Claus D. Gehner Sep. 1978 142 p refs Sponsored by Urban Mass Transportation Admin.
(PB-294967/5; RR-78-1; UMTA-WA-11-0005-79-1) Avail: NTIS HC A07/MF A01 CSCL 13B

The potential for enhancing the use of on-board transit origin-destination (O-D) surveys as a means of satisfying some of the evolving needs of transit planning is explored. The study was designed to reveal the importance of detailed ridership data by demonstrating the potential uses of O-D survey data, by both the transit operator and other municipal agencies concerned with the provision of public transportation. GRA

88 SPACE SCIENCES (GENERAL)

N79-33115# Executive Office of the President, Washington, D. C.
AERONAUTICS AND SPACE REPORT OF THE PRESIDENT, 1978 ACTIVITIES
Jimmy Carter NASA Jul. 1979 109 p
Avail: NTIS MF A01; SOD HC as NAS1.52:978

Highlights of national aeronautics and space programs for the year are described for the following areas: communications, Earth resources, space science, transportation, and space energy. Activities of NASA and five other Federal agencies with the largest programs in these areas are discussed. The national space policy statement is included in the appendixes along with records of U. S. spacecraft launchings, the history of U. S. and Soviet manned space flights; and data related to applications satellites, scientific payloads, and space probes. Budgetary summaries are included. A.R.H.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N79-33116 Pittsburgh Univ., Pa.
AN ANALYSIS OF THE EFFECTS OF OPTICAL ABERRATIONS ON RELATIVE POSITIONS OF STARS IN THE IMAGE PLANE OF ASTROMETRIC TELESCOPES Ph.D. Thesis

George William Jones 1978 213 p
Avail: Univ. Microfilms Order No. 7917478

Theoretical imaging properties of a photographic refractor, a visual refractor, and a photographic reflector were analyzed to study the effect of residual optical aberrations upon the measured relative positions of the images of stars. The optical properties of the telescopes were investigated by ray spot diagrams and point spread functions derived from diffraction theory. For a field of 153 theoretical stars differing in color and magnitude and considering only effects due to the optics of the telescopes, theoretical image positions were generated for three cases: a photographic plate responding to ray optics determined intensities, a photographic plate responding to physical optics derived intensities, and finally a photometer responding to physical optics derived intensities. Geometrical optics was found to be insufficient for accurately describing the image intensity distributions or for generating image positions. Dissert. Abstr.

N79-33117 Princeton Univ., N. J.
NUMERICAL INTEGRATION OF THE ORBIT-AVERAGED FOKKER-PLANCK EQUATION: THE EVOLUTION OF PLUMMER'S MODEL Ph.D. Thesis
Haldan Neal Cohn 1979 86 p
Avail: Univ. Microfilms Order No. 7918555

A numerical method for studying the evolution of spherical star clusters is presented. The method employs direct numerical integration of the orbit averaged Fokker-Planck equation in energy angular momentum space to advance the stellar distribution in time. The gravitational potential, which is treated self consistently, is advanced by means of Poisson's equation and adiabatic invariant theory. Numerical results from a study of the evolution of Plummer's model are reported. The nature of core collapse in a one component cluster is addressed. Whether the structure of the core approaches a self similar state, and whether the evolution of the core is adequately described by the simple evaporative theory are discussed. The results tentatively suggest that the core collapse becomes homologous and asymptotically independent of the structure of the rest of the cluster.
Dissert. Abstr.

N79-33118 Rice Univ., Houston, Tex.
MODELS OF THE DISTRIBUTION OF PHOTOMETRIC PROPERTIES OF GALAXIES WITH STAR FORMATION Ph.D. Thesis
Joseph Coney Davis 1979 137 p
Avail: Univ. Microfilms Order No. 7919576

The method of predicting surface brightnesses and colors of external galaxies using stellar population synthesis is developed for arbitrary birthrate histories. A series of computer programs to perform this calculation is described. Synthetic stellar evolution tracks in log(L sub bol)-log(T sub e) are converted to the Johnson UBVRI system. The contribution of all stellar masses are integrated using the conventional parameterization for the initial mass function (MF) to obtain the luminosity of an aging stellar population in each passband per unit mass of stars. The influence of the IMF on the UBVR colors is discussed. A parameterized birthrate history model which features a long term exponentially decreasing rate of star formation and includes periodic bursts and continuous star formation events in the most recent history is shown to produce a wide range of colors and magnitudes as observed in spiral galaxies. Dissert. Abstr.

N79-33119 Arizona State Univ., Tempe.
THE VISUAL AND NEAR INFRARED SPECTRUM OF METHANE AND ITS APPLICATION TO URANUS, NEPTUNE, TRITON AND PLUTO Ph.D. Thesis
Drayton Chris Benner 1979 198 p
Avail: Univ. Microfilms Order No. 7920600

The spectrum of methane from 4000 to 10600 A with abundances up to 6 km amagat was obtained and analyzed with the Mayer-Goody random band model. Absorption coefficients were determined over the whole wavelength region. The reflection spectrum of Uranus from 4000 to 10000 A was matched with three models of increasing complexity: a reflecting layer model, a semi-infinite isotropic homogeneous scattering model and a clear atmosphere with a scattering haze near the top. The reflecting layer model does not fit well, the homogeneous scattering model leaves discrepancies in the bottoms of the strong methane bands, while the scattering haze model gives a very good fit to the spectrum. To search for atmospheres on Pluto and Triton, spectra of these objects, as well as comparison stars, were obtained with a three stage Varo image tube for the spectral region from 6800 to 9000 A. Dissert. Abstr.

N79-33120 Texas Univ. at Austin.
ASTRONOMICAL SPECTROSCOPY THROUGH REAL TIME COMPUTER CONTROL OF PHOTODIODE ARRAY DETECTORS Ph.D. Thesis
Phillip Wayne Kelton 1979 295 p
Avail: Univ. Microfilms Order No. 7920141

The specification, design, implementation, validation, performance evaluation, and astronomical application of a family of dedicated computer operating systems for real time interactive astronomical spectroscopy using photodiode array detectors at McDonald Observatory. Dissert. Abstr.

N79-33121*# Stanford Univ., Calif. Guidance and Control Lab.
CONTROL SYSTEM DESIGNS FOR THE SHUTTLE INFRARED TELESCOPE FACILITY
J. David Powell, Eric K. Parsons, and Kenneth R. Lorell Oct. 1979 59 p refs
(Grant NsG-2246)
(NASA-CR-162321) Avail: NTIS HC A04/MF A01 CSCL 03A

The stringent pointing and stability requirements of the Shuttle Infrared and Telescope Facility (STIRF) are stressed as well as the demands that infrared astronomy and the STIRF in particular place on the design of the pointing system. M.M.M.

N79-33122*# Science Applications, Inc., Tucson, Ariz.
NEPTUNE: LIMB BRIGHTENING WITHIN THE 7300 ANGSTROM METHANE BAND
Michael J. Price and Otto G. Franz (Lowell Observatory) [1979] 24 p refs
(Contract NASw-3134)
(NASA-CR-162319) Avail: NTIS HC A02/MF A01 CSCL 03A

Narrow-waveband (100A) photoelectric slit scan photometry of the Neptune disk is reported. Observations were concentrated within the strong CH4 band at lambda 7300A. For comparison, measurements were also made within a continuum waveband at lambda 6800A. Point spread function data were obtained in both colors. Qualitative estimates of the true intensity distribution over the Neptune disk were made. Within the lambda 6800A continuum band, Neptune appears as an essentially uniform disk. Within the lambda 7300A CH4 band, the planet exhibits strong limb-brightening. The results appear to require the presence of an optically thin layer of brightly scattering aerosol particles high in the Neptune atmosphere. Author

N79-33123# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
X-RAY OPTICAL CHARACTERISTICS OF A WOLTER TELESCOPE [ROENTGENOPTISCHE EIGENSCHAFTEN EINES WOLTERTELESKOPS]
Axel Ondrusch Sep. 1978 92 p refs In GERMAN
(MPI-PAE/Extraterr-146) Avail: NTIS HC A05/MF A01

The purpose of this 32cm telescope is to study astrophysical objects such as scattering halos. An optimum performance is therefore essential (high resolution, low scatter). The basic principles of the operation of the telescope are described. The results of tests carried out on mirror components and on the overall system are given. Optical sources of various wavelengths were employed; a specially developed high vacuum system with a variable wavelength source was used for the X-ray measurements. The image quality characteristics observed are well within those expected considering surface roughness, scattering, image distortion, reflectivity, and off-axis behavior. Author (ESA)

N79-33124# Academy of Sciences (USSR), Moscow. Inst. of Space Research.
OBSERVATIONS ON V1357 Cyg = Cyg X-1. THE SEARCH FOR THE OPTICAL RADIATION OF THE ACCRETION DISK
V. V. Bruevich, N. N. Kilyachkov, V. S. Shevchenko, and R. A.

Sunyaev 1978 23 p refs
(PR-408) Avail: NTIS HC A02/MF A01

The data from observations of V1357 Cyg during 30 nights in July-September 1977, are presented. The contribution of the disk to the optical of the system is computed taking into account the heating of its surface by V1357 Cyg UV radiation and by Cyg X-1 X-ray radiation. It is suggested that the disk optical radiation can account for the nonregular variability of the system brightness. The possibility of eclipses of the star by the disk and vice versa is discussed. Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N79-33125 Harvard Univ., Cambridge, Mass.
RADIO RECOMBINATION LINE OBSERVATIONS OF THE IONIZED GAS IN THE GALACTIC CENTER Ph.D. Thesis
Luis Felipe Rodriguez 1978 128 p
Avail: Univ. Microfilms Order No. 7919847

The Sgr B2 displayed a He 2 zone with radius about 80% of that of the H 2 zone. This explains the beam-dependent He+/H+ variations. The smaller He 2 zone could be due to preferential absorption of helium-ionizing photons by dust having a smoothly increasing absorptivity shortward of 912 Angstroms. The ionized gas in the extended thermal component is characterized by a low degree of excitation, as indicated by the observed upper limits to the once- and twice-ionized helium abundances. The ionizing agent was favored to be a large number of early B-type stars remaining from a huge burst of star formation that could have occurred at the Galactic Center about 10 to the 7th power years ago. Dissert. Abstr.

N79-33126 Rice Univ., Houston, Tex.
NUCLEOSYNTHESIS IN SUPERNOVAE AND THE ORIGIN OF ISOTOPIC HETEROGENEITY IN THE EARLY SOLAR SYSTEM Ph.D. Thesis
John Adrian Morgan 1979 163 p
Avail Univ. Microfilms Order No. 7919613

A model for the nucleosynthetic yields or 20 less than or equal to A less than or equal to 30 from a massive supernova (spectral class O or B on the main sequence) is developed and compared with the requirements of a hypothetical trigger for solar system formation. A static network simulates the pre-supernova nuclear evolution of the neon- and carbon-bearing zones of a 24 M sub sun star. The peak burning conditions for explosive nucleosynthesis from shock passage are obtained. Comparisons are made with similarity solutions and results of hydrodynamic calculations of shock passage. Except for Al-26 the products of static carbon burning dominate abundance patterns in the ejecta. Both explosive carbon burning and explosive neon burning contribute significantly to Al-26 production. Free neutron levels in this part of the supernova may allow synthesis of K-40, Pd-107, I-129 and possibly other rare, heavy nuclei in interesting amounts. Dissert. Abstr.

N79-33127 Princeton Univ., N. J.
ON THE DESCRIPTION AND DEVELOPMENT OF LARGE CLUSTERS OF GALAXIES THROUGH THE CLUSTER-GALAXY CORRELATIONS Ph.D. Thesis
James Nathan Fry 1979 154 p
Avail: Univ. Microfilms Order No. 7920410

A simple model is presented for the form of the three-point function in terms of products of two-point functions, and the assumed form for the spatial functions is shown to give in projection the observed angular functions. The amplitude coefficient is interpreted as a measure of the dispersion in cluster sizes. A theoretical description of the development of a rich cluster comes from the BBGKY hierarchy of equations for the correlation functions. The model suggested by the catalogs and supported by the N-body results permits the truncation of the hierarchy and results in a closed set of equations for the cluster-galaxy two-point function and auxiliary velocity moments. The asymptotic form the solution far from the cluster center is fixed by the initial power spectrum of irregularities, and a scaling assumption relates this to the solution for small separation. Dissert. Abstr.

N79-33128 Wesleyan Univ., Middletown, Conn.
THE DISSIPATION OF COSMIC MAGNETIC FIELDS Ph.D. Thesis
Harlan Arthur Hurwitz 1979 164 p
Avail: Univ. Microfilms Order No. 7920637

The dissipation of magnetic fields capable of of influencing galaxy formation is calculated through the recombination period and beyond. When ambipolar diffusion is appreciable, the field decreases in strength immediately and steeply. After the ionization has reached its minimum value, decay is more gradual. For initial field strengths at recombination ranging from 1 G to 10 to the -8th power G, the calculated fields at z = 100 vary from 10 to the -8th power G to 10 to the -12th power G, respectively. The spectral density peak shifts dramatically to smaller values, corresponding to a magnetic field length scale at z = 100 that may be six orders of magnitude larger than the length scale implied by flux conservation in an expanding universe. The dissipated magnetic field energy does not cause a temperature rise becasue the coupling between free electrons and photons through Thomson scattering and the enormous heat capacity of the background radiation ensure that the radiation acts as a heat sink. Dissert. Abstr.

N79-33129 Harvard Univ., Cambridge, Mass.
AN OPTICAL ANALYSIS OF DUST COMPLEXES IN SPIRAL GALAXIES Ph.D. Thesis
Debra Arine Meloy Elmegreen 1979 177 p
Avail: Univ. Microfilms Order No. 7919846

A method for quantitatively investigating properties of dust regions in external galaxies that involves matching radiative transfer models (with absorption plus scattering) to multicolor photographic and photometric observations is presented. The technique was used to study dust complexes in the late type spiral galaxies NGC 628 (M74), NGC 5194 (M51), NGC (M101), and NGC 7793. The dust lanes on the inner edges of the spiral arm branches had internal densities that were approximately ten times larger than in their comparison regions, in contrast to the normal dust lanes which had density enhancements of a factor of approximately three. A feature common to all program galaxies is a high latitude cloud with an internal extinction of some two mag analogous to well studied clouds in the Milky Way galaxy. A few moderately dense clouds were also observed in some of the galaxies near the midplane. No large clouds of greater opacity were detected, suggesting that they have already begun to form stars. Dissert. Abstr.

N79-33130 New York Univ., N. Y.
A MODEL FOR DIFFUSE INTERSTELLAR CLOUDS: IMPROVEMENTS TO THE THEORY OF MOLECULAR HYDROGEN PHOTODESTRUCTION AND TO THE GAS PHASE CHEMISTRY OF CARBON MONOXIDE Ph.D. Thesis
Steven Robert Federman 1979 154 p
Avail: Univ. Microfilms Order No. 7918951

A theoretical model was developed to determine physical processes in conjunction with astrophysical observation. The calculations are based on isobaric, steady state, plane-parallel conditions. In the model, the cloud is illuminated by ultraviolet radiation from one side. The density and temperature of the gas are derived by involving energy conservation in terms of thermal balance. The abundance of approximately fifty atomic and molecular species, including important ionic species and simple carbon and oxygen bearing molecules was determined. Except for molecular hydrogen formation on dust grains, binary gas phase reactions are used to develop the chemistry of the model cloud. The theoretical model was appropriate for a particular range of physical parameters. The results of the steady state calculations were compared to ultraviolet observations, predominantly those with the Copernicus satellite. Dissert. Abstr.

N79-33131 Massachusetts Univ., Amherst.
ON THE STRUCTURES OF HII REGIONS AND THEIR DISTRIBUTION IN THE GALAXY Ph.D. Thesis
Felix James Lockman 1979 284 p
Avail: Univ. Microfilms Order No. 7920863

The use of radio recombination lines to determine structure HII regions and the distribution HII regions in the Galaxy is addressed. The formation and transfer of radio recombination lines are treated and various processes that effect the ability to deduce nebular properties from radio observations are examined. The distribution of dense HII regions is derived using kinematic models based on circular rotation and density wave theory. A survey of less dense ionized gas is described. The absence of HII regions from large areas of the Galaxy that are well populated by atomic and molecular clouds indicates that the formation of massive stars does not result simply from the presence of molecular clouds, but requires an additional factor like a density wave. Dissert. Abstr.

N79-33132# Max-Planck-Institut fuer Astronomie, Heidelberg (West Germany).
THE ZODIACAL LIGHT EXPERIMENT E9 ON HELIOS A AND B Final Report
Christoph Leinert, Eckart Pitz, Hartmut Link, and Norbert Salm Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 88 p refs In GERMAN; ENGLISH summary
(Contracts BMFT-WRS-0107-I; GfW-01-H-3009-I)
(BMFT-FB-W-78-28) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Germany DM 18.30

The zodiacal light experiment on board the space probes Helios A and B is described. The experiment was to measure intensity and polarization of the zodiacal light in three broad spectral ranges: U (360 nm), B (420 nm), and V (540 nm) at ecliptic latitudes of beta = + or - 16 deg, + or - 31 deg, and + or - 90 deg. A detailed account of the experimental design, including discussion of the hardware used, is given and complete results obtained are shown. Author (ESA)

N79-33133# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
HUBBLE EXPANSION IN A EUCLIDEAN FRAMEWORK
Hannes Alfven Mar. 1979 35 p refs Submitted for publication
(Grant NSF AST-76-15521)
(TRITA-EPP-79-07) Avail: NTIS HC A03/MF A01

A model of the Hubble expansion which is as far possible from the conventional big bang model without coming in conflict with any well established observational results and which introduces no new laws of physics was constructed. This cosmological model is used to investigate the consequences of a non-cosmological interpretation of the QSO redshift. An essentially Euclidean metagalactic description is justified by a backwards-in-time extrapolation of the Hubble expansion to a minimum size galaxy whose size is about 100 times the Schwarzschild limit. The kinetic energy of the Hubbel expansion is attributed to an intense QSO-like activity in the minimum size metagalaxy. Some of the conclusions based on the big bang hypothesis are criticized and alternative interpretations are suggested. A comparison between the Euclidean and conventional models is given. Author (ESA)

N79-33134# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
AN ANNIHILATION MODEL OF THE QSO'S
Hannes Alfven Apr. 1979 45 p refs
(Grant NSF AST-76-15521)
(TRITA-EPP-79-08) Avail: NTIS HC A03/MF A01

A simple phenomenological model of QSO's based on star-antistar collisions is developed. This model can account such basic observational properties as the acceleration to very large (noncosmological) velocities, the existence of broad emission lines, and at the same time narrow absorption lines with different redshifts. The absence of blue-shifts is also explained. The model predicts that relatively young QSO's should be at cosmological distances whereas the old ones may very well be much closer to us than indicated by their redshift. Author (ESA)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N79-33135 California Inst. of Tech., Pasadena.
STUDIES OF NOBLE GASES IN METEORITES AND IN THE EARTH Ph.D. Thesis
Stephen Pritchard Smith 1979 425 p
Avail: Univ. Microfilms Order No. 7920357

The isotopic and elemental abundances of noble gases in the solar system are investigated, using simple mixing models and mass-spectrometric measurements of the noble gases in meteorites and terrestrial rocks and minerals. Dissert. Abstr.

N79-33136 California Inst. of Tech., Pasadena.
ANALYSIS OF SMALL SCALE LUNAR GRAVITY ANOMALIES: IMPLICATIONS FOR CRATER FORMATION AND CRUSTAL HISTORY Ph.D. Thesis
John Joseph Dvorak 1979 267 p
Avail: Univ. Microfilms Order No. 7919859

Anomalies in the local gravity field of the moon which arise from lateral density variations within the planetary body were examined to infer the subsurface structure and possibly characterize the processes which formed these features. Results of the analysis include: (1) young lunar craters have negative Bouguer gravity anomalies most likely caused by the presence of a large lens of low density material; (2) the old, unfilled lunar craters have zero Bouguer anomalies, suggesting that the porosity initially produced by the impact events was removed by the intrusion of igneous material or by compacting of the crust during the seismic shaking which accompanied the formation of the last lunar multiringed basins; (3) the positive Bouguer anomaly of a small, multiringed basin, Grimaldi, is accounted for by the mare material lying within the inner ring, a plug of high density lunar mantle material, and a ring of low density ejecta material; (4) two nonimpact features, Lamont and Marius Hills, have positive Bouguer anomalies most likely associated with intrusive activity within the lunar crust. Dissert. Abstr.

N79-33137 California Inst. of Tech., Pasadena.
OBSERVATIONS OF 1-6 MeV JOVIAN ELECTRONS AT 1 AU AND A STUDY OF THEIR PROPAGATION Ph.D. Thesis
Steward Russell Hartman 1979 232 p
Avail: Univ. Microfilms Order No. 7920353

The electron/isotope spectrometers on the IMP-7 and IMP-8 satellites measured the non-solar interplanetary electron flux. Eighty-eight Jovian increases, identified in five synodic periods were classified by their time profiles. The fall time profiles were consistent with an exponential fall with tau approximately 4 to 9 days. The rise time profiles displayed a systematic variation over the synodic period. Exponential rise time profiles with tau approximately 1 to 3 days tended to occur in the time period before nominal connection, diffusive profiles predicted by the convention-diffusion model around nominal connection, and abrupt profiles after nominal connection. The electron data were modeled by using a convection-diffusion model of Jovian electron propagation. The synodic envelope formed by the maxima of the Jovian increases was modeled by the envelope formed by the predicted intensities at a time less than that needed to reach equilibrium. Dissert. Abstr.

N79-33138*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MODELS OF P/TEMPEL 2
Ray L. Newburn, Jr. 1 Sep. 1979 52 p refs
(Contract NAS7-100)
(NASA-CR-162292; JPL-Pub-79-60) Avail: NTIS HC A04/MF A01 CSCL 03B

Quantitative models of Comet Tempel 2 at various heliocentric distances were created using a semi-empirical theory which ties gas production rates to the light curve. Physical properties of the nucleus and gas and dust densities are supplied for a nominal case and two extreme cases at each distance, the extreme cases being based upon a sum-of-negative-tolerances approach. G.Y.

N79-33139*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLANETARY DATA SYSTEM REQUIREMENTS: MULTIMISSION RADIO SCIENCE REQUIREMENTS FOR THE 1978 TO 1988 ERA
H. T. Howard, ed. 1 Oct. 1979 66 p refs
(Contract NAS7-100)
(NASA-CR-162306; JPL-Pub-79-74) Avail: NTIS HC A04/MF A01 CSCL 03B

The functional and performance requirements for support of multimission radio science are established. The classes of radio science investigation are described and the needed data is discussed. This document is for a sliding ten year period and will be iterated as the mission set evolves. Author

N79-33140*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
NUTATION OF MARS
R. A. Lyttleton, D. L. Cain, and A. S. Liu 15 Aug. 1979 14 p refs
(Contract NAS7-100)
(NASA-CR-162300; JPL-Pub-79-85) Avail: NTIS HC A02/MF A01 CSCL 03B

The mathematical theory of the nutation of Mars is derived by classical rigid-body dynamics. The effect of nutation is to produce a 26-m maximum horizontal amplitude oscillation (at the surface of Mars) with a period of half a Martian year. This effect should be detectable in the Viking-Lander data. Author

N79-33141*# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.
LUNAR STUDIES Final Technical Report
Thomas Gold 1979 41 p
(Grant NGL-33-010-005)
(NASA-CR-162318) Avail: NTIS HC A02/MF A01 CSCL 03B

Experimental and theoretical research, concerning lunar surface processes and the nature, origin and derivation of the lunar surface cover, conducted during the period of February 1, 1971 through January 31, 1976 is presented. The principle research involved were: (1) electrostatic dust motion and transport process; (2) seismology properties of fine rock powders in lunar conditions; (3) surface processes that darken the lunar soil and affect the surface chemical properties of the soil grains; (4) laser simulation of micrometeorite impacts (estimation of the erosion rate caused by the microemeteorite flux); (5) the exposure history of the lunar regolith; and (6) destruction of amino acids by exposure to a simulation of the solar wind at the lunar surface. Research papers are presented which cover these general topics. G.Y.

N79-33142# Academy of Sciences (USSR), Moscow. Inst. of Space Research.
THE MAPPING OF MARTIAN SOIL DENSITY. A COMPARISON OF ALBEDO, TOPOGRAPHY, AND GEOLOGY
V. I. Ezerskyi, N. N. Kroupenio, and V. I. Mamnischky 1978 28 p refs
(PR-417) Avail: NTIS HC A03/MF A01

Results from the Mariner and Viking probes as well as from ground radar observations, relative to Mars, were analyzed in order to correlate the hypsometric and geological data on Martian soil density and albedo. The presence of two types of friable material (dark and light), with a predominance of light, is noted. The variation in density of the upper soil layer and surface albedo according to geological age was revealed. Geologically younger regions turn out to be more loosely packed and are characteristically lighter. Author (ESA)

N79-33143# Academy of Sciences (USSR), Moscow. Inst. of Space Research.
SIMULATION OF COMETARY MAGNETIC TAILS
I. M. Podgorny, E. M. Dubinin, Y. N. Potanin, and S. I. Shkolnikova 1978 13 p
(PR-439) Avail: NTIS HC A02/MF A01

In order to simulate a cometary tail under laboratory conditions a hydrogen collisionless supersonic plasma flow with the magnetic field frozen in was used. A wax ball served as a model of the comet nucleus. The experimental conditions corresponded to a limiting simulation. Field lines enveloped the nucleus on the day side and stretched along the flow at the night side. Tension of the field lines in the magnetic tail resulted in the acceleration of the ionized products of wax evaporation attaining a velocity of about one million cm/sec. The control experiments showed that the magnetic tail is caused by currents due to the Lorentz electric field. Author (ESA)

N79-32239*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A GEOLOGIC ASSESSMENT OF POTENTIAL LUNAR ORES
David S. McKay and Richard J. Williams *In* NASA. Ames Res. Center Space Resources and Space Settlements 1979 p 243-255 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 03B

N79-32241*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MINING AND BENEFICIATION OF LUNAR ORES
Theodore E. Bunch, Richard J. Williams (NASA. Johnson Space Center), David S. McKay (NASA. Johnson Space Center), and David Giles (Rio Amex Corp.) *In its* Space Resources and Space Settlements 1979 p 275-288 refs (For primary document see N79-32225 23-12)
Avail: NTIS MF A01; SOD HC CSCL 03B

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N79-33144# Astronomical Inst., Utrecht (Netherlands).
SOLAR MeV PROTONS RECORDED DURING EXPERIMENT S 99 ON BOARD ESRO-4 IN 1973
H. F. vanBeek, J. N. vanGils, W. DeGraaff, and R. M. vanHees Paris ESA Apr. 1979 51 p refs
(ESA-STR-203) Avail: NTIS HC A04/MF A01

Experiment S 99, designed to observe solar protons with energies between 2 and 100 MeV as well as alpha particles with energies between 4 and 240 MeV, was successfully flown aboard the satellite ESRO-4 between November 22, 1972 and April 15, 1974. Two solid-state particle telescopes were used in the instrument. The energy intervals for both particle species were logarithmically divided into six channels. Three proton events were recorded in 1973: on April 12/th, April 29th, and September 7th, respectively. A description is given of the design and operation of the instrument. For each of the three events, polar cap proton registrations are presented for approximately every sixth orbit. Author (ESA)

N79-33145# Ruhr Univ., Bochum (West Germany). Bereich Extraterrestrische Physik.
HEATING OF SPHERICAL INTERPLANETARY PARTICLES CLOSE TO THE SUN (SOLAR PROBE HELIOS A AND B: EXPERIMENT 10 Z) Final Report
Maria Rohde Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 105 p refs In GERMAN; ENGLISH summary
(Contract BMFT-WRS-01081; DFVLR-01-BPT-QC-036A)
(BMFT-FB-W-78-33) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Ger. DM 21,85

The temperature of interplanetary dust grains as a function of solar distance is discussed, adopting simplified assumptions for the energy distribution in the solar spectrum. These temperatures determine strongly possible evaporation close to the sun. This is important for the interpretation of helios measurements, especially with respect to micrometeorites. After a thorough review and compilation of the theoretical background (Mie-formalism), the efficiency factors for absorption and radiation pressure were calculated taking into account the wavelength dependence of refractive indices of different materials. Using these data and the energy distribution of the solar spectrum, equilibrium temperatures were computed for particles up to 100 microns in size. Considerable differences between the materials (magnetite, obsidian, andesite, olivine) were found. Furthermore deviations of equilibrium temperatures from the blackbody approximation, especially in the size region 0.2 microns, suggest different particle

concentrations near the sun for different types of particles depending on size and material. Author (ESA)

N79-33146# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 415, MARCH 1979. PART 1: PROMPT REPORTS, DATA FOR FEBRUARY 1979, JANUARY 1979
Helen E. Coffey, ed. Mar. 1979 166 p ref
(PB-296275/1; SGD-415-Pt-1) Avail: NTIS HC A08/MF A01 CSCL 03B

Data are provided for February 1979 on: alert periods, daily solar indices, solar flares, solar radio emission, spacecraft observations, coronal holes, inferred interplanetary magnetic field polarities, mean solar magnetic field, solar wind measurements and Boulder Geomagnetic Substorm Log. Data are also provided for January 1979 on: daily solar activity center, sudden ionospheric disturbances, solar radio emission, cosmic rays, geomagnetic indices and radio propagation indices. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N79-33147 Catholic Univ. of America, Washington, D. C.
SATELLITE OBSERVATIONS OF RAPIDLY VARYING COSMIC X-RAY SOURCES Ph.D. Thesis
Gregory Scott Maurer 1979 169 p
Avail: Univ. Microfilms Order No. 7920561

The Celestial X-ray Detector onboard the OSO-8 spacecraft was used to observe two very different periodic X-ray sources, the pulsar in the Crab nebula and the X-ray binary Her X-1. The Crab pulsar was observed for eight days in 1976 March and six days in 1977 March. The pulsed and nonpulsed components of the X-ray spectrum showed no significant changes from 1976 to 1977. The X-ray binary Her X-1 was observed for twelve days in 1977 September. Dissert. Abstr.

N79-33148# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
INVESTIGATION OF THE ANOMALOUS COMPONENT OF LOW ENERGY COSMIC RAYS: EXPERIMENTAL RESULTS AND A NUMERICAL MODEL [UNTERSUCHUNG DER ANOMALEN KOMPONENTE DER NIEDERENERGETISCHEN KOSMISCHEN TEILCHENSTRAHLUNG: EXPERIMENTELLE ERGEBNISSE UND EIN NUMERISCHES MODELL]
Berndt Klecker Jul. 1978 177 p refs In GERMAN
(MPI-PAE/Extraterr-147) Avail: NTIS HC A09/MF A01

The origin of this anomalous component was studied from low energy cosmic ray data obtained during the quiet sun (November 1973 to September 1976). The N, O, and Ne fluxes (with energies in excess of 3 MeV/nucleon) that are not correlated with interplanetary activity and whose relative frequencies indicate them to be of neither galactic nor solar origin are observed. It is postulated that this component arises from neutral interstellar gas ionized and accelerated by magnetoacoustic waves. The calculated numerical model shows that a group of four simultaneous parameters are sufficient to reproduce the measured energy spectra, the relative frequencies recorded, and the radial gradients observed (heliosphere magnitude, magnitude and energy dependence of the acceleration coefficient, and the number of ions accelerated). Author (ESA)

N79-33149# Lund Univ. (Sweden). Dept. of Physics.
THE COSMIC RAY BORON AND CARBON ISOTOPIC COMPOSITION MEASURED IN NUCLEAR EMULSIONS
C. Bjarle, N-Y. Herrstroem, G. Joensson, and K. Kristiansson 7 May 1979 30 p refs
(LUIP-7906) Avail: NTIS HC A03/MF A01

The isotopic compositions of primary cosmic ray boron and carbon in the energy interval 135 to 390 MeV/N were studied using photometric measurements obtained from tasks found in an Ilford G5 emulsion stack exposed to the radiation. The boron measurement is the first that has been made with nuclear emulsions. The carbon measurement makes it possible to substantially improve the statistical accuracy in the determination of 13 C abundance as compared to earlier emulsion measurements. The mass determinations are based on measurements of the relation between track with and residual range with a high precision nuclear track photometer. The method of measurement is briefly described with special emphasis on the errors which arise in this kind of measurement. Preliminary isotopic ratios obtained in this investigation are reported. Author (ESA)

99 GENERAL

N79-33150# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
SCIENTIFIC RESEARCH, 1977 Annual Report [JAHRESBERICHT 1977]
1978 149 p In GERMAN Original contains color illustrations
Avail: NTIS HC A07/MF A01

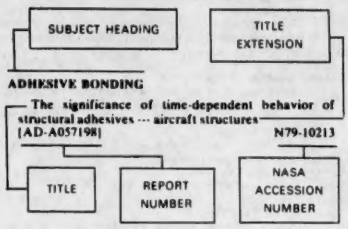
A general overview of technology developments in air transportation, aircraft design, space flight technology, reconnaissance, and energy and propulsion systems is given. Specific topics covered include: (1) future systems, safety, and guided flights; (2) models of pilot-cabin interfaces, aerodynamics, aeronautics, control systems including auromatic control, missiles, rotary wings, and weight reduction; (3) intelligence, target recognition, and underwater techniques; (4) probes and space laboratories; and (5) turbogenerators, noise reduction, reduction of emissions, and high energy lasers. J.M.S.

N79-33151# Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e. V., Karlsruhe (West Germany). Inst. fuer Systemtechnik und Innovationsforschung.
PUBLISHED PATENT APPLICATIONS AND PATENTS RESULTING FROM GERMAN GOVERNMENT SPONSORED RESEARCH AND DEVELOPMENT Final Report
Gerhard Jaeckel and Ingrid Zierl Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1978 112 p In GERMAN; ENGLISH summary
(Contract BMFT-NT-0442)
(BMFT-FB-T-78-31) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Eggenstein-Leopoldshafen, West Ger. DM 23,55

The ministry for Research and Technology of the Federal Republic of Germany has sponsored research and development related to industrial innovations since 1969. Work reported on includes the published patent applications and patents from all projects which were sponsored up to and including 1974. Fields covered are electronics, optics, nonnuclear energy technology, applications of pure physics, materials development, and industrial processes technology. Author (ESA)

SUBJECT INDEX

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

A

A-7 AIRCRAFT
Technology trends and maintenance workload requirements for the A-7, F-4, and F-14 aircraft
[AD-A070036] N79-32153
ABERRATION
On the minimization of spherical aberration in spherical reflector antennas
[NASA-TM-80140] N79-32466
An analysis of the effects of optical aberrations on relative positions of stars in the image plane of astrometric telescopes
N79-33116
ABSORBENTS
Statistical thermodynamics of sorption in molecular sieves
N79-33095
ABSORPTION CROSS SECTIONS
Coupled neutron and photon cross sections for transport calculations
[LA-7808-MS] N79-32988
ABSORPTION SPECTRA
Ultraviolet absorption spectrum of methylchloroform in the vapor phase
[AERONOMICA-ACTA-A-203-1979]
N79-32766
Stark modulation spectroscopy of molecular crystals
N79-33066
AC GENERATORS
Demonstration of a free piston Stirling engine driven linear alternator system
[COO-2764-002] N79-32713
ACCELERATION [PHYSICS]
Low detonation velocity: High energy explosives
[UCRL-80458] N79-32376
Swedish earthquakes and acceleration probabilities
[FOA-C-20295-E4] N79-32782
Paratransit vehicle test and evaluation. Volume 2: Acceleration and interior measurement tests
[PB-295476/6] N79-33109
ACCELEROMETERS
Requirements analysis and feasibility study for the Spacelab user program: Supersensitive optical accelerometer
[BMFT-FB-W-78-18] N79-32245
ACCUMULATORS
Multistage depressed collector for dual mode operation --- for travelling wave tubes
[NASA-CASE-LEW-13282-1] N79-32463
ACCURACY
A review of the fundamental methods used for measuring gage pressures up to kPa
[NPL-MOM-34] N79-32533
ACOUSTIC ATTENUATION
A filled silicone rubber materials system with selectable acoustic properties for molding and coating applications at ultrasonic frequencies
[AD-A070461] N79-32972
ACOUSTIC EMISSION
Acoustic emission behavior of a low alloy steel --- pressure vessels
[AD-A069965] N79-32339
Proceedings of the ARPA/AFML Review of Progress in Quantitative Nondestructive Evaluation
[AD-A071047] N79-32563
ACOUSTIC MEASUREMENTS
Distributed sensor networks
[AD-A070455] N79-32438
Comparison of some methods for measuring speech levels
[IZF-1978-22] N79-32976
Paratransit vehicle test and evaluation. Volume 5: Noise tests
[PB-295479/0] N79-33110
ACOUSTIC SIMULATION
Laboratory study of annoyance to combined airplane and road-traffic noise
[NASA-TP-1478] N79-32743
ACOUSTICS
Experimental superposition of acoustic fields for detection performance studies
[AD-A070963] N79-32970
Applications of the modulation transfer function in room acoustics
[IZF-1978-19] N79-32975
ACTUATORS
Experimental determination of the equation of state of explosives and pyrotechnics used in explosive actuators
[SAND-78-8628] N79-32392
ADAPTIVE CONTROL
Communication application of adaptive arrays
[AD-A070181] N79-32431
High power phase locked laser oscillators
[NASA-CR-159630] N79-32538
ADAPTIVE FILTERS
Transient behavior of the LMS adaptive filter-response to variable frequency spectral lines
[AD-A070470] N79-32470
ADDITIVES
Evaluation and auger analysis of a zinc-dialkyldithiophosphate antiwear additive in several diester lubricants
[NASA-TP-1544] N79-32359
ADHESIVES
Lunar building materials: Some considerations on the use of inorganic polymers --- adhesives, coatings, and binders
N79-32238
Molecular structure and cohesive properties of polymeric adhesives
[AD-A069517] N79-32365
Microscopic investigation of electrostatic discharge phenomena on nonconductive optical solar reflectors with a conductive adhesive
[ESA-STM-211] N79-32729
ADIABATIC FLOW
ADINC: An implicit Lagrangian hydrodynamics code
[AD-A070361] N79-32503
ADIRONDACK MOUNTAINS [NY]
Deep crustal electrical conductivity in the Adirondacks
N79-32758
ADSORPTION
Photoemission studies of H2S, H2, and S adsorbed on Ru[110]: Evidence for an adsorbed SH species
[AD-A070054] N79-32307
A theoretical and experimental study of the thermal properties of xenon adsorbed on graphite
N79-33071
Theory of phase transitions in gases adsorbed on solids
N79-33072
ADVECTION
A class of finite element methods for advection-diffusion problems with small diffusion
[CTH-79.01-R] N79-32929
AERIAL RECONNAISSANCE
Prediction of the recognition of real objects as a function of photometric and geometric characteristics
[AD-A071118] N79-32614
AERODYNAMIC CHARACTERISTICS
Effect of outboard vertical-fin position and orientation on the low-speed aerodynamic performance of highly swept wings --- supersonic cruise aircraft research
[NASA-TM-80142] N79-32158
Calculation of subsonic normal force and centre of pressure position of bodies of revolution using a slender body theory: Boundary layer method
[WSRL-0093-TR] N79-32160
A program to compute three-dimensional subsonic unsteady aerodynamic characteristics using the doublet lattic method, L216 [DUBFLX]. Volume 1: Engineering and usage
[NASA-CR-2849] N79-32163
Some aerodynamic performance calculations on missile configurations
[AD-A070433] N79-32168
Experimental investigation of the aerodynamic characteristics of a wing in a jet flow --- wind tunnel tests
[NLR-TR-77081-U] N79-32177
Aerodynamic data for three supercritical airfoils: RAE[NPL]9515 and 9530, and RAE 9550. Parts 1 and 2
[ARC-R/M-3820] N79-32178
The design and aerodynamic characteristics of an 18% thick shock-free airfoil [NLR 7501]
[NLR-MP-78016-U] N79-32180
Aerodynamic stability technology for maneuverable missiles. Volume 1: Configuration aerodynamic characteristics
[AD-A070250] N79-32250
Data verification tests of a 0.03-scale NASA space shuttle launch vehicle at Mach numbers from 0.60 to 1.55
[AD-A070442] N79-32256
AERODYNAMIC COEFFICIENTS
Wind tunnel tests on cambered wings of mild gothic planform. Part 1: Further low speed tests. Part 2: Transonic tests
[ARC-R/M-3827] N79-32179
AERODYNAMIC CONFIGURATIONS
Helicopter flow field analysis
[AD-A069542] N79-32174
Transonic wing redesign using a generalized fictitious gas method
[AD-A070013] N79-32202
AERODYNAMIC FORCES
Prediction of aerodynamic forces on a circular cylinder and a thin airfoil in a transonic airstream by the finite element method
[AD-A070663] N79-32171
AERODYNAMIC HEATING
Heat-transfer measurements on a 5-deg sharp cone using infrared scanning and on-board discrete sensor techniques
[AD-A070363] N79-32169
Aerodynamic heating in the fin interaction region of generalized missile shapes at Mach 6 [modular missile test program] --- wind tunnel tests
[AD-A071573] N79-32173
AERODYNAMIC INTERFERENCE
A vortex lattice technique for computing ventilated wind tunnel wall interference
[AD-A070445] N79-32220
AERODYNAMIC LOADS
Random harmonic analysis program, L221 [TEV156]. Volume 2: Supplemental system design and maintenenace document
[NASA-CR-2858] N79-32162
AERODYNAMIC NOISE
An experimental investigation of the acoustic characteristics of a variety of slot baffle configurations for transonic wind tunnel walls
[AD-A070261] N79-32223
Some nonlinear problems in transonic helicopter acoustics
[AD-A069564] N79-32974
AERODYNAMICS
Aeronautical Engineering. A continuing bibliography, supplement 112
[NASA-SP-7037[112]] N79-32150
Scientific research, 1977 --- an overview of air transportation, aircraft design, propulsion systems, space technology, and reconnaissance
N79-33150

AEROELASTICITY
HiMAT structural development design methodology --- aeroelastic tailoring of the canard and wing box and distributed load tests
[NASA-CR-144886] N79-32197
Investigations on the aeroelastic stability of large wind turbines
[NPL-MP-78014-U] N79-32731
AERONAUTICAL ENGINEERING
Aeronautical Engineering. A continuing bibliography, supplement 112
[NASA-SP-7037(112)] N79-32150
Aeronautics and space report of the President, 1978 activities
N79-33115
Scientific research, 1977 --- an overview of air transportation, aircraft design, propulsion systems, space technology, and reconnaissance
N79-33150
AERONAUTICS
Factor of safety - USAF design practice --- conferences
[AD-A070237] N79-32183
AERONOMY
Aeronomical models of the stratosphere
[AERONOMICA-ACTA-A-202-1979] N79-32765
Ultraviolet absorption spectrum of methylchloroform in the vapor phase
[AERONOMICA-ACTA-A-203-1979] N79-32766
AEROSOLS
Combustion of uniformly sized droplet sprays in a refractory tube
N79-32299
On the electrically stimulated filtration of aerosols --- the effects of fiber shape on charged particles
N79-32300
Infinite cloud model of electrification by the precipitation mechanism in the presence of high rates of ion generation
[UCRL-13860] N79-32774
AEROSPACE ENGINEERING
Space resources and space settlements
[NASA-SP-428] N79-32225
Aeronautics and space report of the President, 1978 activities
N79-33115
AEROSPACE ENVIRONMENTS
Space resources and space settlements
[NASA-SP-428] N79-32225
Systems engineering overview for regenerative life-support systems applicable to space habitats
N79-32226
Research planning criteria for regenerative life-support systems applicable to space habitats
N79-32227
Effect of environmental parameters on habitat structural weight and cost
N79-32228
AEROSPACE MEDICINE
Refinement and validation of a three-dimensional head-spin model
[AD-A062502] N79-32826
AEROSPACE SCIENCES
A guide and handbook for using the GE Space/RESD libraries
[DOC-79SDS030] N79-33101
AEROSPACE SYSTEMS
Scientific research, 1977 --- an overview of air transportation, aircraft design, propulsion systems, space technology, and reconnaissance
N79-33150
AFTERGLOWS
Infrared chemiluminescence studies of ion-molecule reactions in a flowing afterglow
[AD-A070068] N79-32309
AGRICULTURE
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions --- Rio Grande Valley, Texas
[E79-10280] N79-32606
Recent measurements of the rates of ozone removal from the atmosphere by land surfaces --- agricultural land
[CONF-780636-11] N79-32748
AIR BREATHING ENGINES
Stirling laboratory research engine survey report
[NASA-CR-162304] N79-32636
AIR DROP OPERATIONS
Recovery systems design guide
[AD-A070251] N79-32170
AIR JETS
Velocity field of a round jet in a cross flow for various jet injection angles and velocity ratios --- Langley V/STOL tunnel
[NASA-TP-1506] N79-32500
AIR NAVIGATION
Recognition of the aircraft navigation light colour code
N79-32186
Low-cost inertial navigation for moderate-g missions
[NASA-TM-78611] N79-32205
AIR POLLUTION
Design of an improved air quality telemetry system
[PB-296076/3] N79-32259
The 16 air and water pollution issues facing the nation: Appendix to report
[CED-78-148C-APP-1] N79-32742
Some problems of validation and testing of numerical air pollution models
[COO-2874-41] N79-32749
Summary of group 1 control technique guideline documents for control of volatile organic emissions from existing stationary sources
[PB-294975/8] N79-32755
AIR QUALITY
Design of an improved air quality telemetry system
[PB-296076/3] N79-32259
VOC [Volatile Organic Compounds] emissions reduction study for oxidant attainment in Massachusetts, Rhode Island, and Connecticut
[PB-294983/2] N79-32754
AIR TO AIR MISSILES
Navy air-launched missile operating and support cost estimating model
[AD-A069527] N79-32251
AIR TO AIR REFUELING
Pilot performance in simulated aerial refueling as a function of tanker model complexity and visual display field-of-view
[AD-A070231] N79-32832
AIR TRAFFIC
Cockpit displays of traffic information: Airline pilots opinions about content, symbology, and format
[NASA-TM-78601] N79-32185
AIR TRAFFIC CONTROL
Numerical studies of conversion and transformation in a surveillance system employing a multitude of radars, part 2 --- advanced air traffic control services
[AD-A072086] N79-32415
Numerical studies of conversion and transformation in a surveillance system employing a multitude of radars, part 1 --- advanced air traffic control services
[AD-A072085] N79-32416
AIR TRANSPORTATION
Aircraft vortex marking program
[NASA-CR-162299] N79-32156
Trends in the air service provided by certificated carriers: 1938-1977
[PB-295190/3] N79-32184
AIR WATER INTERACTIONS
Ocean wave forecasting
[AD-A069469] N79-32819
AIRBORNE EQUIPMENT
The design of an error detection and correction system for use with single track airborne digital magnetic recording systems
[RAE-TM-IT-171] N79-32534
AIRCRAFT ANTENNAS
Radiation pattern sidelobes and null filling produced by aircraft vibration
[AD-A070472] N79-32422
AIRCRAFT APPROACH SPACING
Comparison of some methods to determine the delays of landing aircraft with respect to runway capacity
[NLR-MP-77028-U] N79-32191
AIRCRAFT COMPARTMENTS
Release-rate calorimetry of multilayered materials for aircraft seats
[NASA-TM-78594] N79-32265
AIRCRAFT DESIGN
Multi-element airfoil design by optimization
[NLR-TR-78135-U] N79-32181
HiMAT structural development design methodology --- aeroelastic tailoring of the canard and wing box and distributed load tests
[NASA-CR-144886] N79-32197
Experimental methods for aircraft design qualifications in an exploding warhead environment
[AD-A070381] N79-32203
Aircraft design loads due to non-stationary atmospheric turbulence patches
[NLR-TR-78073-U] N79-32216
Scientific research, 1977 --- an overview of air transportation, aircraft design, propulsion systems, space technology, and reconnaissance
N79-33150
AIRCRAFT DETECTION
Distributed sensor networks
[AD-A070455] N79-32438
AIRCRAFT EQUIPMENT
Centralizing Air Force aircraft component repair in the field can provide significant savings
[PB-295320/6] N79-32154
A study of the EMP interaction with aircraft over an imperfect ground plane
[AD-A070388] N79-32420
AIRCRAFT FUELS
Aviation turbine fuels, 1978 --- thermophysical properties
[BETC/PPS-79/2] N79-32381
Comparison of alternate fuels for aircraft --- liquid hydrogen, liquid methane, and synthetic aviation kerosene
[NASA-TM-80155] N79-32637
AIRCRAFT INSTRUMENTS
Record keeping on aircraft instruments
[PB-295698/5] N79-32208
AIRCRAFT LANDING
Aircraft vortex marking program
[NASA-CR-162299] N79-32156
Comparison of some methods to determine the delays of landing aircraft with respect to runway capacity
[NLR-MP-77028-U] N79-32191
Trials of the Doppler microwave landing system at London [Gatwick] Airport, August 1977
[RAE-TR-78124] N79-32194
Trials of the Doppler microwave landing system at Manchester International Airport, October/November 1977
[RAE-TR-78144] N79-32195
AIRCRAFT MAINTENANCE
Technology trends and maintenance workload requirements for the A-7, F-4, and F-14 aircraft
[AD-A070036] N79-32153
AIRCRAFT NOISE
Laboratory study of annoyance to combined airplane and road-traffic noise
[NASA-TP-1478] N79-32743
Commercial aircraft flight deck noise criteria
[AD-A072029] N79-32969
AIRCRAFT PILOTS
Cockpit displays of traffic information: Airline pilots opinions about content, symbology, and format
[NASA-TM-78601] N79-32185
AIRCRAFT RELIABILITY
Preliminary airworthiness evaluation CH-47C with fiberglass rotor blades with T55-L-712 engines
[AD-A069891] N79-32199
AIRCRAFT STABILITY
Random harmonic analysis program, L221 [TEV156]. Volume 2: Supplemental system design and maintenenace document
[NASA-CR-2858] N79-32162
Wind shear during approach: An investigation into the influence of a tower measured wind environment on the symmetric motions of a simulated aircraft during an automatic approach --- DC 9 aircraft
[NLR-TR-77078-U] N79-32192
Powered-lift aircraft handling qualities in the presence of naturally-occurring and computer-generated atmospheric disturbances
[AD-A072118] N79-32198
AIRCRAFT STRUCTURES
Modal interpolation program, L215 [INTERP]. Volume 1: Engineering and usage
[NASA-CR-2847] N79-32164
Environmental fatigue crack propagation in metal/composite laminates
[NLR-MP-78027-U] N79-32283
Aluminum alloys for advanced structural applications in transport aircraft
[NLR-MP-77023-U] N79-32344
AIRFOIL PROFILES
Aerodynamic data for three supercritical airfoils: RAE[NPL]9515 and 9530, and RAE 9550. Parts 1 and 2
[ARC-R/M-3820] N79-32178
The design and aerodynamic characteristics of an 18% thick shock-free airfoil [NLR 7501]
[NLR-MP-78016-U] N79-32180
Multi-element airfoil design by optimization
[NLR-TR-78135-U] N79-32181
AIRFOILS
Multi-element airfoil viscous-inviscid interactions
[NASA-CR-159125] N79-32157
AIRFRAME MATERIALS
Collected engineering data sheets, Air Force data sheet program --- airframe materials
[AD-A070665] N79-32201
Residual strength properties of carbon/epoxy composite materials --- airframe materials
[NLR-TR-77039-U] N79-32281
Aluminum alloys for advanced structural applications in transport aircraft
[NLR-MP-77023-U] N79-32344
Gust spectrum fatigue crack propagation in candidate skin materials
[NLR-MP-78022-U] N79-32597
AIRFRAMES
Investigation of penetration of electromagnetic energy through joints in advanced composite structures --- aircraft structures
[AD-A069589] N79-32441
AIRPORT TOWERS
An investigation into the noise interference problems at Logan Airport, Boston
[AD-A072057] N79-32417
AIRPORTS
Trends in the air service provided by certificated carriers: 1938-1977
[PB-295190/3] N79-32184
Comparison of some methods to determine the delays of landing aircraft with respect to runway capacity
[NLR-MP-77028-U] N79-32191
Recycling of asphalt concrete airfield pavement: A laboratory study
[AD-A072117] N79-32218

ALASKA
Rocket-based measurement of Birkeland currents in an active post-midnight aurora
N79-32762
Winter circulation and hydrography over the continental shelf of the north gulf of Alaska
[PB-296914/5] N79-32821
ALBEDO
Radiation variability and correlation studies --- earth-atmosphere system
N79-32802
The mapping of Martian soil density. A comparison of albedo, topography, and geology
[PR-417] N79-33142
ALCOHOLS
For today: Membrane-produced gasahol. For tomorrow: Membrane-produced alcohol
[PB-295814/8] N79-32395
ALFALFA
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
ALGEBRA
Algebraic systems: Applications in the behavioral and social sciences
[AD-A070103] N79-32966
ALGORITHMS
The application of difference methods in fluid mechanics
[AD-A069544] N79-32511
Cellular graph automata
N79-32874
Implementation and evaluation of interval arithmetic software. Report 3: The Honeywell G635 system
[AD-A070374] N79-32878
A brief guide to NPL Algorithms Library, 1979
[NPL-CSU-3/79] N79-32884
Algorithms for discovering hierarchical relationships among dichotomous items
N79-32904
Some algorithmic problems in linear systems, I
[AD-A070138] N79-32911
The AQ algorithm for the solution of a sparse system of linear equations
[NPL-DNACS-17/79] N79-32928
A proposal for the use of new parallel multiplication and division algorithms, modeled after Egyptian and Babylonian prototypes
[CTH-MATH-1979-5] N79-32933
The construction of Jacobi and periodic Jacobi matrices with prescribed spectra
[AD-A070214] N79-32951
Practical control algorithms for nonlinear stochastic systems and investigations of nonlinear filters
[AD-A069980] N79-32953
Simulation of high dimensional systems
N79-32958
On the rate of superlinear convergence of a class of variable metric methods
[AD-A070209] N79-32961
Image restoration by short space spectral subtraction
[AD-A070382] N79-33013
ALIGNMENT
PEP laser surveying system
[LBL-8412] N79-32545
ALKALINE EARTH METALS
Ion bombardment of materials containing alkali metals of alkaline earths
[AD-A070284] N79-32541
ALLOCATIONS
The radio spectrum international allocation and regulation
[AD-A070110] N79-32437
ALPHA PARTICLES
Inelastic electron scattering from Li-7 in the vicinity of the alpha-triton threshold
[AD-A071072] N79-32983
ALUMINUM
High-energy electron-induced damage production at room temperature in aluminum-doped silicon
N79-32662
ALUMINUM ALLOYS
Collected engineering data sheets, Air Force data sheet program --- airframe materials
[AD-A070665] N79-32201
Role of deformation processing on the fatigue behavior of a high strength powder metallurgy aluminum alloy
N79-32318
Selecting aluminum alloys to resist failure by fracture mechanisms
[ALCOA-57-77-24-REV] N79-32323
Fatigue failure prediction by X-ray double crystal diffractometry
[AD-A070296] N79-32327
NDE method for characterizing anodized Al surfaces
[AD-A070936] N79-32337
Aluminum alloys for advanced structural applications in transport aircraft
[NLR-MP-77023-U] N79-32344
The effect of sheet thickness on flight simulation fatigue crack propagation in 2024-T3, 7475-T761, and mill annealed Ti-6Al-4V
[NLR-MP-77024-U] N79-32345
Heat treatment studies of aluminum alloy type 7050 forgings. Corroded-specimen fatigue tests and SSC propagation tests
[NLR-TR-77124-U] N79-32351
Fracture along planar slip bands
[AD-A070788] N79-32585
Effect of sheet metal thickness on crack propagation --- Duralumin
[ISD-240] N79-32593
The axial loading corrosion fatigue properties of 25mm thick high and low strength X166 plate [DTD 5120 and DTD 5130]
[RAE-TR-78114] N79-32600
GaAs/AlGaAs herterojunction gate field effect transistor
[AD-A070081] N79-33082
ALUMINUM COATINGS
Deflagration to detonation transition behavior of aluminized HMX
[AD-A070645] N79-32371
ALUMINUM COMPOUNDS
Experimental studies of valence instabilities
[AD-A070352] N79-32306
ALUMINUM OXIDES
A microstructural investigation of plasma-sprayed metal and oxide coatings
N79-32320
AMBIENT TEMPERATURE
Fracture mechanics and ambient temperature sustained load fracture
[NLR-MP-78008-U] N79-32595
AMBIPOLAR DIFFUSION
Variational description of the positive column with two-stem ionization
[NASA-CR-162314] N79-33035
AMMONIA
Kinetics and reaction products of aerobic pyrrhotite [FeS] hydrolysis at ambient temperatures
[METC/RI-79/3] N79-32311
AMOR ASTEROID
An assessment of near-earth asteroid resources
N79-32235
AMORPHOUS MATERIALS
Orientation of crystalline overlayers on amorphous substrates by artificially produced surface relief structures
[AD-A071168] N79-33091
AMORPHOUS SEMICONDUCTORS
Optical versus transport processes in chalcogenide glasses
[AD-A070927] N79-32360
AMPHETAMINES
Effects of amphetamine on response selection and response execution processes in choice reaction tasks
[IZF-1978-8] N79-32839
AMPLIFICATION
Channel Islands television programme links: The design of a uhf feed antenna for a 9.14m diameter paraboidal reflector
[BBC-RD-1979/12] N79-32403
AMPLITUDE DISTRIBUTION ANALYSIS
Seismological studies using observed and synthetic waveforms --- included are wave amplitudes from earthquakes and nuclear explosions
N79-32757
ANALOG DATA
PCM techniques aid in storing analog data: An exact magnetic-tape storage method for analog measurement signals
[ORNL/TR-4573] N79-32529
ANALOG SIMULATION
Wind shear during approach: An investigation into the influence of a tower measured wind environment on the symmetric motions of a simulated aircraft during an automatic approach --- DC 9 aircraft
[NLR-TR-77078-U] N79-32192
Simulation of communications systems for TV transmission, exchange of radio programs, and long-distance telephony
[BMFT-FB-W-78-27] N79-32445
ANALYSIS (MATHEMATICS)
Spectral characteristics of convolutionally coded digital signals
[NASA-CR-162285] N79-32412
A mathematical analysis of the rotary piercing process
N79-32548
Problem formulation --- governing equations for the behavior of general shell forms
N79-32579
ANALYTIC FUNCTIONS
Analytic approximation of concave functions
[CTH-MATH-1979-2] N79-32931
A deterministic model in biomathematics. Asymptotic behavior and threshold conditions
[CTH-MATH-1979-8] N79-32935
ANALYTICAL CHEMISTRY
Electroanalytical applications of reticulated vitreous carbon electrodes
N79-32296
ANALYZERS
Computer automation of continuous-flow analyzers for trace constituents in water. Volume 4: Description of program segments. Part 1: TAAIN
[UCRL-52532-VOL-4-PT-1] N79-32310
ANIONS
Binding of anionic dyes to cation-specific poly [crown ethers]
N79-32356
ANISOTROPY
Determination of the thermal conductivity of carbon fiber reinforced plastic sheet material
[NLR-TR-77113-U] N79-32284
ANNEALING
CO2 laser annealing of 50-microns-thick silicon solar cells
N79-32659
Reverse annealing in radiation-damaged, silicon solar cells
N79-32660
Effect of dopants on annealing performance of silicon solar cells
N79-32661
Radiative transitions induced in GaAs by modest heat treatment
[AD-A071039] N79-33088
New materials properties achievable by ion implantation doping and laser processing --- for crystal regrowth by ion scattering
[CONF-781121-22] N79-33093
ANNIHILATION REACTIONS
An annihilation model of the QSO's
[TRITA-EPP-79-08] N79-33134
ANODIC COATINGS
Semiconducting properties of passive films on tin in slightly alkaline solutions
N79-32294
NDE method for characterizing anodized Al surfaces
[AD-A070936] N79-32337
ANTENNA ARRAYS
Baseband signal combiner for antenna array
[NASA-CASE-NPO-14641-1] N79-32408
Evaluation of the JPL X-band 32 element active array --- for deep space communication
[NASA-CR-162297] N79-32409
ANTENNA DESIGN
Channel Islands television programme links: The design of a uhf feed antenna for a 9.14m diameter paraboidal reflector
[BBC-RD-1979/12] N79-32403
ANTENNA RADIATION PATTERNS
Metal grid angular filters for sidelobe suppression
[AD-A070111] N79-32424
A study of the scanning properties of some simple reflections
[AD-A070112] N79-32434
ANTENNAS
An investigation into the noise interference problems at Logan Airport, Boston
[AD-A072057] N79-32417
ANTIMATTER
An annihilation model of the QSO's
[TRITA-EPP-79-08] N79-33134
APOLLO ASTEROIDS
An assessment of near-earth asteroid resources
N79-32235
APPLICATIONS OF MATHEMATICS
Computational nature of combustion modeling
[SAND-78-8245] N79-32313
APPLICATIONS PROGRAMS (COMPUTERS)
Structured programming in a database environment
[AD-A070270] N79-32881
APPROACH CONTROL
Wind shear during approach: An investigation into the influence of a tower measured wind environment on the symmetric motions of a simulated aircraft during an automatic approach --- DC 9 aircraft
[NLR-TR-77078-U] N79-32192
APPROXIMATION
Numerical methods and approximation and modelling problems in stochastic control theory
[AD-A070038] N79-32898
Searching for solutions of finite nonlinear systems: An interval approach
N79-32903
A comparison of the existence theorems of Kantorovich and Moore
[AD-A070203] N79-32908
Error estimates for mixed methods --- for the approximation solution of elliptic boundary value problems
[AD-A070196] N79-32920
Analytic approximation of concave functions
[CTH-MATH-1979-2] N79-32931
AQUICULTURE
Overview of waste heat utilization techniques --- spray irrigation, soil heating, aquiculture and biomass production
[CONF-790443-2] N79-32726
ARC DISCHARGES
Damage of metal surfaces by a hot dense deuterium plasma --- using unipolar arcing for the study of fusion reactor materials
[COO-4393-03] N79-33057

ARC MELTING
Observations of the vacuum arc and metal transfer during vacuum consumable arc remelting --- maraging steel alloys
[SAND-79-0922C] N79-32342
ARC WELDING
On the welding of martensitic hardened steels
[BMVG-FBWT-78-17] N79-32556
ARCHITECTURE
Design of software tools for microprogrammable microprocessors
[TRITA-NA-79-03] N79-32886
ARCHITECTURE [COMPUTERS]
CHEOPS: A project for evaluating ANSI/SPARC architecture
[AD-A070218] N79-32854
Query execution in DIRECT
[AD-A070195] N79-32856
Decomposition of weighted graphs using the interchange partitioning technique
[AD A069549] N79-32859
Elements of a theory of computer systems
N79-32890
High performance computer systems
[UCID-17914] N79-32891
ARGON
Ion bombardment of materials containing alkali metals of alkaline earths
[AD-A070284] N79-32541
Single electron capture into AR[+] excited states in Ar2 [+] Na collision below 12 keV. 1: Absolute measurement of emission cross-section
[IPPJ-410] N79-33034
ARIANE LAUNCH VEHICLE
ARIANE Passenger Experiment [APEX]: Planning study
[BMFT-FB-W-77-24] N79-32244
ARIZONA
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Ariz a Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
[E79-10271] N79-32605
Geologic application of thermal-inertia mapping from satellite --- Powder River Basin, Arizona and Wyoming
[E79-10282] N79-32607
ARMED FORCES [FOREIGN]
The multinational F-16 aircraft program: Its progress and concern
[PB-296999/6] N79-33098
ARMED FORCES [UNITED STATES]
Centralizing Air Force aircraft component repair in the field can provide significant savings
[PB-295320/6] N79-32154
Navstar-Global Positioning System [GPS] Army User Equipment [AUE] Required Operational Capability [ROC]
[AD-A070139] N79-32189
ARRAYS
Further results on an array design to measure the wavenumber-frequency spectrum beneath an axisymmetric turbulent boundary layer
[AD-A071048] N79-32505
ARRESTERS
Dielectric stimulated arcs in lightning arrestor connectors
[SAND-79-0396C] N79-32480
ARROW WINGS
Effect of outboard vertical-fin position and orientation on the low-speed aerodynamic performance of highly swept wings --- supersonic cruise aircraft research
[NASA-TM-80142] N79-32158
ARTIFICIAL INTELLIGENCE
On the efficient implementation of production systems
N79-32873
ASPHALT
Recycling of asphalt concrete airfield pavement: A laboratory study
[AD-A072117] N79-32218
Prevention of early pavement deterioration --- due to moisture in asphalt mixes, temperature susceptability, and transverse cracking
[PB-296337/9] N79-32402
ASTEROID MISSIONS
Round-trip missions to low delta-V asteroids and implications for material retrieval
N79-32233
Retrieval of asteroidal materials
N79-32234
An assessment of near-earth asteroid resources
N79-32235
ASTEROIDS
Round-trip missions to low delta-V asteroids and implications for material retrieval
N79-32233
ASTROMETRY
An analysis of the effects of optical aberrations on relative positions of stars in the image plane of astrometric telescopes
N79-33116
ASTRONOMICAL MODELS
Models of the distribution of photometric properties of galaxies with star formation
N79-33118
Hubble expansion in a Euclidean framework
[TRITA-EPP-79-07] N79-33133
ASTRONOMICAL PHOTOGRAPHY
An optical analysis of dust complexes in spiral galaxies
N79-33129
ASTRONOMICAL PHOTOMETRY
An optical analysis of dust complexes in spiral galaxies
N79-33129
ASTRONOMICAL SPECTROSCOPY
Astronomical spectroscopy through real time computer control of photodiode array detectors
N79-33120
ASTRONOMICAL TELESCOPES
Calculation and construction of wide band far infrared filters [MPE balloon telescope]
[MPI-PAE/EXTRATERR-146] N79-33024
An analysis of the effects of optical aberrations on relative positions of stars in the image plane of astrometric telescopes
N79-33116
ASTRONOMY
Models of P/Tempel 2
[NASA-CR-162292] N79-33138
ASTROPHYSICS
Models of P/Tempel 2
[NASA-CR-162292] N79-33138
ASYMPTOTES
Analytic approaches to unstable resonators --- calculating the eigenvalues and eigenmodes of large Fresnel number resonators using asymptotic approaches
[AD-A071024] N79-32473
ASYMPTOTIC SERIES
Extrapolation of asymptotic expansions by a modified Aitken delta sup 2 formula
[SU-326-P-30-61] N79-32882
Asymptotic distributions of slope of greatest convex minorant estimators
[AD-A070205] N79-32921
A deterministic model in biomathematics. Asymptotic behavior and threshold conditions
[CTH-MATH-1979-8] N79-32935
ATMOSPHERIC ATTENUATION
Atmospheric extinction. I: Synthetic data
[AD-A071006] N79-32772
ATMOSPHERIC BOUNDARY LAYER
A bulk model of the atmospheric planetary boundary layer
[DM-28] N79-32790
ATMOSPHERIC CIRCULATION
Climate diagnostics --- using radiation and meteorological data for diagnosing climatic fluctuations
N79-32800
ATMOSPHERIC COMPOSITION
Recent measurements of the rates of ozone removal from the atmosphere by land surfaces --- agricultural land
[CONF-780636-11] N79-32748
ATMOSPHERIC EFFECTS
Atmospheric propagation research at 20 and 30 GHz
[ESA-CR[P]-1201] N79-32447
Meteorological Effects of Thermal Energy Releases [METER] program
[ORNL/TM-6248] N79-32812
ATMOSPHERIC ELECTRICITY
Infinite cloud model of electrification by the precipitation mechanism in the presence of high rates of ion generation
[UCRL-13860] N79-32774
ATMOSPHERIC HEAT BUDGET
Radiation budget and related measurements in 1985 and beyond --- earth radiation budget satellite system
N79-32804
ATMOSPHERIC MODELS
An improved ionospheric irregularity model
[AD-A070282] N79-32773
Spectral lineshape calculation for a stratospheric emission model
[NPL-QU-50] N79-32780
A bulk model of the atmospheric planetary boundary layer
[DM-28] N79-32790
The wave structures of the Eady model of baroclinic instability
[NASA-TP-1548] N79-32796
Proceedings of the 8th Technical Exchange Conference
[AD-A070009] N79-32806
Use of Galerkin methods in numerical weather prediction
[AD-A070458] N79-32807
ATMOSPHERIC MOISTURE
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model --- Los Angeles, California and St. Louis, Missouri
[E79-10269] N79-32604
ATMOSPHERIC PHYSICS
High power phase locked laser oscillators
[NASA-CR-159630] N79-32538
Auroral data analysis
[AD-A070180] N79-32770
ATMOSPHERIC RADIATION
Radiation modeling --- solar and terrestrial radiation
N79-32801
Radiation variability and correlation studies --- earth-atmosphere system
N79-32802
Cloudiness and the radiation budget
N79-32803
ATMOSPHERIC SCATTERING
Multiple scattering effects on transmission through the atmosphere
[AD-A070471] N79-32419
Guide for estimating dry deposition velocities of sulfur over the eastern United States and surrounding regions
[ANL/RER-79-2] N79-32750
ATMOSPHERIC TEMPERATURE
Temperature, molecular nitrogen concentration and turbulence in the lower thermosphere inferred from incoherent scatter data
[AERONOMICA-ACTA-A-204-1979]
N79-32767
A bulk model of the atmospheric planetary boundary layer
[DM-28] N79-32790
ATMOSPHERIC TURBULENCE
Powered-lift aircraft handling qualities in the presence of naturally-occurring and computer-generated atmospheric disturbances
[AD-A072118] N79-32198
Aircraft design loads due to non-stationary atmospheric turbulence patches
[NLR-TR-78073-U] N79-32216
Temperature, molecular nitrogen concentration and turbulence in the lower thermosphere inferred from incoherent scatter data
[AERONOMICA-ACTA-A-204-1979]
N79-32767
ATOMIC CLOCKS
Synchronization of clocks in the 100 ps range
[ONERA-NT-1978-1] N79-32968
ATOMIC COLLISIONS
Single electron capture into AR[+] excited states in Ar2 [+] Na collision below 12 keV. 1: Absolute measurement of emission cross-section
[IPPJ-410] N79-33034
ATOMIC ENERGY LEVELS
Optical detection of spectral diffusion of the triplet state zerofield transition energy --- liquid crystals
[AD-A071179] N79-33084
ATOMIC STRUCTURE
Pseudopotential methods in the calculation of electronic properties and quadrupole interactions in metals
N79-33074
ATOMIC THEORY
The von Weizsaecker and exchange corrections in the Thomas Fermi theory
N79-32981
ATOMIC WEIGHTS
The absolute isotopic abundance and atomic weight of thallium
N79-32295
ATOMIZING
Pneumatic atomization of viscoelastic fluids
N79-32493
ATOMS
Shock tube studies of reaction and energy transfer rates between molecules and reactive atoms
N79-32980
The von Weizsaecker and exchange corrections in the Thomas Fermi theory
N79-32981
ATTITUDE GYROS
Low-cost inertial navigation for moderate-g missions
[NASA-TM-78611] N79-32205
ATTITUDE INDICATORS
Design fabrication and installation of a yaw measuring device
[NASA-CR-161300] N79-32526
ATTITUDE STABILITY
Multiple attitude maneuvers for a spinning spacecraft disturbed by solar radiation
[NLR-TR-78078-U] N79-32260
AUDITORY PERCEPTION
Effects of acute noise traumata on whole-nerve and single-unit activity
[IZF-1978-23] N79-32829
AUGER SPECTROSCOPY
Evaluation and auger analysis of a zinc-dialkyldithiophosphate antiwear additive in several diester lubricants
[NASA-TP-1544] N79-32359

AURORAL ABSORPTION
Lower ionosphere ion production density and composition in an auroral absorption event
[UIO-SR-79-01] N79-32791
AURORAS
Rocket-based measurement of Birkeland currents in an active post-midnight aurora
N79-32762
Auroral data analysis
[AD-A070180] N79-32770
AUSTRIA
Space activity in Austria, 1978/79
N79-32249
AUTOMATA THEORY
Cellular graph automata
N79-32874
AUTOMATIC CONTROL
The automatic revision of storage structures
N79-32844
AUTOMATIC LANDING CONTROL
Wind shear during approach: An investigation into the influence of a tower measured wind environment on the symmetric motions of a simulated aircraft during an automatic approach --- DC 9 aircraft
[NLR-TR-77078-U] N79-32192
AUTOMATIC WEATHER STATIONS
Aviation automated weather observation system [AV-AWOS]
[AD-A072119] N79-32805
AUTOMOBILE ACCIDENTS
Chemical de-icing of roads: The effect on road accidents
[VTI-145] N79-33106
AUTOMOBILES
Estimates of maximum electric field strengths in the automobile environment
[PB-294819/8] N79-32453
Car driving as a cybernetic task
[IZF-1979-6] N79-32838
Paratransit vehicle test and evaluation. Volume 5: Noise tests
[PB-295479/0] N79-33110
AVALANCHES
Dynamic effects of avalanche-generated carriers
[AD-A070258] N79-32471
AVIONICS
Avionics cost development for use of Loran-C navigation systems by low performance general-aviation aircraft
[AD-A068268] N79-32206
AXIAL FLOW
Optimum axial flow taper in a countercurrent gas centrifuge
[KJOA-4445] N79-32504
AXIAL FLOW TURBINES
Flow in nonrotating passages of radial inflow turbines
[NASA-CR-159679] N79-32212
AXIAL LOADS
The axial loading corrosion fatigue properties of 25mm thick high and low strength X166 plate [DTD 5120 and DTD 5130]
[RAE-TR-78114] N79-32600
AXIOMS
Groups with solvable word problems
N79-32868
AXISYMMETRIC BODIES
Some aerodynamic performance calculations on missile configurations
[AD-A070433] N79-32168

B

B-1 AIRCRAFT
Survey and evaluation of potential real-time interactive flight test facilities for the B-1
[AD-A070343] N79-32222
BACKSCATTERING
Implantation metallurgy
[SAND-78-1089C] N79-32341
D region amplitude distribution, cone angle of arrival, and electron density profiles
[AD-A070358] N79-32771
Brillouin backscatter dependence upon pulse amplitudes, timing, target material and geometry
[AD-A070300] N79-33037
BALL BEARINGS
Comparison of predicted and measured elastohydrodynamic film thickness in a 20-millimeter-bore ball bearing
[NASA-TP-1542] N79-32552
Survivability of silicon nitride bearing
[AD-A070383] N79-32553
BALLISTICS
Development of a large electrically driven flyer system for explosive initiation studies
[LA-UR-78-2279] N79-32377
BALLOON FLIGHT
Results of the 1978 NASA/JPL balloon flight solar cell calibration program
[NASA-CR-162298] N79-32635
BANDPASS FILTERS
Calculation and construction of wide band far infrared filters [MPE balloon telescope]
[MPI-PAE/EXTRATERR-146] N79-33024
BANDWIDTH
The effect of program behavior upon interleaved memory bandwidth in a multiprocessor environment
[AD-A070115] N79-32855
The enlargement of fast avalanche photodiode bandwidths by capacitance compensation
[IPF-77-3] N79-33060
BAROCLINIC WAVES
The wave structures of the Eady model of baroclinic instability
[NASA-TP-1548] N79-32796
BASES
CHEOPS: A project for evaluating ANSI/SPARC architecture
[AD-A070218] N79-32854
BATHYMETERS
Limnology of Lake Champlain
[PB-295612/6] N79-32625
BAYES THEOREM
Application of Bayesian techniques to reliability demonstration, estimation and updating of the prior distribution
[AD-A070236] N79-32559
A Bayesian approach to random coefficient models --- using linear regression models
N79-32944
Robustness in the strategy of scientific model building
[AD-A070213] N79-32945
A comparison of sampling plans for Bayesian estimation of a Poisson process rate
[AD-A070215] N79-32948
BEACHES
Basic remote sensing investigation for coastal reconnaissance
[AD-A070770] N79-32615
BEAM CURRENTS
High current pulsed linear ion accelerators for inertial fusion applications
[SAND-78-0778C] N79-33056
BEAMS [RADIATION]
The 500 MeV, 10% d.f. linear accelerator [MEA] under construction at Amsterdam
[REPT-79/1] N79-33008
BEARINGS
Behavior of composite bolted joints at elevated temperature
[NASA-CR-159137] N79-32574
BENDING
Sixth order analyses of closure in a cracked-elastic-plastic plate
[AD-A070466] N79-32586
BENEFICIATION
Mining and beneficiation of lunar ores
N79-32241
BIAS
The evaluation and control of the changes in basic statistics encountered in grouped data --- normally distributed data
N79-32943
BIBLIOGRAPHIES
Aeronautical Engineering. A continuing bibliography, supplement 112
[NASA-SP-7037[112]] N79-32150
Boron reinforced composites, volume 2. A bibliography with abstracts
[NTIS/PS-79/0476/6] N79-32292
Atmospheric propagation research at 20 and 30 GHz
[ESA-CR[P]-1201] N79-32447
Microwave communication, volume 2. A bibliography with abstracts
[NTIS/PS-79/0525/0] N79-32454
Radiation damage of laser materials. A bibliography with abstracts
[NTIS/PS-79/0514/4] N79-32547
Hypothermia. A bibliography with abstracts
[NTIS/PS-79/0533/4] N79-32830
Transportation systems center bibliography of technical reports
[PB-296342/9] N79-33107
BINARY SYSTEMS [MATERIALS]
Low cycle fatigue behavior of Ti-Mn alloys
N79-32321
BINDERS [MATERIALS]
Lunar building materials: Some considerations on the use of inorganic polymers --- adhesives, coatings, and binders
N79-32238
BINDING
Binding of anionic dyes to cation-specific poly [crown ethers]
N79-32356
BIOCHEMISTRY
Mechanisms of oxygen toxicity at the cellular level
[AD-A070026] N79-32823
BIODYNAMICS
Refinement and validation of a three-dimensional head-spin model
[AD-A062502] N79-32826
BIOENGINEERING
Refinement and validation of a three-dimensional head-spin model
[AD-A062502] N79-32826
BIOLOGICAL EFFECTS
Methods for studying and criteria for evaluating the biological effects of electric fields of industrial frequency
[CONF-780541-1] N79-32827
BIOMASS
Peat gasification: An experimental study
[CONF-780611-8] N79-32391
Overview of waste heat utilization techniques --- spray irrigation, soil heating, aquiculture and biomass production
[CONF-790443-2] N79-32726
BIOMASS ENERGY PRODUCTION
Mission analysis for the federal fuels from biomass program. Volume 4: Thermochemical conversion of biomass to fuels and chemicals
[SAN-0115-T3] N79-32384
Mission analysis for the Federal Fuels from biomass program. Volume 1: Summary and conclusions
[SAN-0115-T2] N79-32385
Potential use of wood and agriculture wastes as steam generator fuel for thermal enhanced oil recovery
[SAN-1038-PO-1] N79-32717
BIOMEDICAL DATA
Survey of biomedical and environmental data bases, models, and integrated computer systems at Argonne National Laboratory
[ANL/ES-65] N79-32745
BIOMETRICS
Biomedical communications experiments using the communications technology satellite: Executive summary
[PB-294405/6] N79-32459
BIONICS
Refinement and validation of a three-dimensional head-spin model
[AD-A062502] N79-32826
BIPOLAR TRANSISTORS
Dynamic effects of avalanche-generated carriers
[AD-A070258] N79-32471
BIREFRINGENCE
A rheo-optical study of the stress-induced crystallization of poly[ethylene terephthalate]
N79-32353
BISTATIC REFLECTIVITY
Bistatic scattering reflection asymmetry and polarization reversal symmetry
[AD-A071008] N79-32426
Measurements of bistatic clutter cross section
[AD-A071193] N79-32428
BIVARIATE ANALYSIS
Estimation of the operating characteristics of item response categories. 7: Bivariate P.D.F. approach with normal approach with normal approach method
[AD-A070130] N79-32950
BLACK HOLES [ASTRONOMY]
Observations on V1357 Cyg = Cyg X-1. The search for the optical radiation of the accretion disk
[PR-408] N79-33124
BLAST LOADS
Experimental methods for aircraft design qualifications in an exploding warhead environment
[AD-A070381] N79-32203
BLOCH BAND
Horizontal Bloch line motion in magnetic bubble materials
N79-33068
BLOCKING
Measured blockage effects on bluff bodies in closed and open wind tunnels
[RAE-TR-78151] N79-32182
Estimation of tunnel blockage from wall pressure signatures: A review and data correlation
[NASA-CR-152241] N79-32219
Block implementation of digital filters
N79-32462
BLOCKS
Unitary block diagonalization and the characteristic polynomial of a pencil generated by Hermitian matrices
N79-32902
BLOOD FLOW
Oxygen delivery in the hypoxic perfused heart: Relation to functional and metabolic changes
N79-32825
BLUFF BODIES
Measured blockage effects on bluff bodies in closed and open wind tunnels
[RAE-TR-78151] N79-32182
BODIES OF REVOLUTION
Calculation of subsonic normal force and centre of pressure position of bodies of revolution using a slender body theory: Boundary layer method
[WSRL-0093-TR] N79-32160
Numerical solution to the inverse problem of the geodetic ellipsoid of revolution
[SER-B-228-MITT-145] N79-32778
BODY TEMPERATURE
Hypothermia. A bibliography with abstracts
[NTIS/PS-79/0533/4] N79-32830

BODY-WING AND TAIL CONFIGURATIONS
Aerodynamic stability technology for maneuverable missiles. Volume 1: Configuration aerodynamic characteristics
[AD-A070250] N79-32250
BONDING
An application of the theory of materials with variable bonding to solid propellant
[AD-A070188] N79-32370
BORESIGHTS
Development of techniques for the design of athermalized optical systems --- for focusing and boresighting using wave theory
[AD-A070257] N79-33016
BORON
Reverse annealing in radiation-damaged, silicon solar cells
N79-32660
Effect of dopants on annealing performance of silicon solar cells
N79-32661
BORON CARBIDES
Hydrogen retention and release in first-wall coatings for Tokamaks
[SAND-78-2128C] N79-33055
BORON ISOTOPES
The cosmic ray boron and carbon isotopic composition measured in nuclear emulsions
[LUIP-7906] N79-33149
BORON REINFORCED MATERIALS
Boron reinforced composites, volume 2. A bibliography with abstracts
[NTIS/PS-79/0476/6] N79-32292
BOUNDARY LAYER COMBUSTION
Measured effects of boundary conditions on oxides of nitrogen produced by liquid fuel diffusion flames
N79-32302
BOUNDARY LAYER CONTROL
European Research Program on Viscous Flows [EUROVISC]
[NLR-MP-78033-U] N79-32519
BOUNDARY LAYER FLOW
Calculation of the flow around a swept wing, taking into account the effect of the three-dimensional boundary layer. Part 2: Wing with laminar boundary layer on the lower surface
[NLR-TR-77066-U] N79-32176
Effect of compressibility, suction, and heat transfer on the nonparallel stability of boundary-layer flows
N79-32494
Nonparallel stability of two-dimensional nonuniformly heated boundary-layer flows
[NASA-CR-162309] N79-32499
The application of difference methods in fluid mechanics
[AD-A069544] N79-32511
European Research Program on Viscous Flows [EUROVISC]
[NLR-MP-78033-U] N79-32519
BOUNDARY LAYER SEPARATION
Unsteady boundary layer separation
[AD-A070742] N79-32507
Rocket-based measurement of Birkeland currents in an active post-midnight aurora
N79-32762
BOUNDARY LAYER TRANSITION
A correlation of artificially induced boundary-layer transition data from blunt slender cones at hypersonic speeds
[AD-A070446] N79-32165
Longitudinal vortices in a transitioning boundary layer --- wind tunnel investigation
[NASA-TM-80161] N79-32498
BOUNDARY LAYERS
Boundary layer effects in composite laminates
N79-32271
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model --- Los Angeles, California and St. Louis, Missouri
[E79-10269] N79-32604
Plasma sheath processes
[AD-A070819] N79-33044
BOUNDARY VALUE PROBLEMS
Boundary layer effects in composite laminates
N79-32271
Contact stresses on bodies with arbitrary geometry
N79-32569
Studies in gravimetric geodesy
[AD-A064741] N79-32768
Theory of connectivity: A unified approach to boundary methods --- integral equations and series expansions
[AD-A070198] N79-32909
Efficient higher order single step methods for parabolic problems, part I
[AD-A070217] N79-32910
Collocation approximation to eigenvalues of an ordinary differential equation: The principle of the thing
[AD-A070197] N79-32913
Some relations between nonexpansive and order preserving mappings
[AD-A070202] N79-32918
Variational principles for problems with linear constraints. Prescribed jumps and continuation type restrictions
[AD-A070199] N79-32919
Error estimates for mixed methods --- for the approximation solution of elliptic boundary value problems
[AD-A070196] N79-32920
Efficient time-stepping methods for miscible displacement problems with nonlinear boundary conditions
[AD-A070211] N79-32922
On maximum error and boundary conditions in cubic spline interpolation at equidistant knots
[TRITA-NA-79-02] N79-32938
Some properties of linear multistep and one-leg methods for ordinary differential equations
[TRITA-NA-79-04] N79-32939
Generalized disks of contractivity for explicit and implicit Runge-Kutta methods
[NASA-CR-162125] N79-32940
Planar deformation of granular materials
N79-33075
BRANCHING [PHYSICS]
Steady capillary-gravity waves on deep water
N79-32759
Electrons and kaons in charmed particle decays --- produced in electron-positron annihilation
[LBL-9017] N79-33003
BREAKWATERS
Suspended sediment in breaking waves
N79-32817
BREMSSTRAHLUNG
Inverse bremsstrahlung absorption rate in an intense laser field
[UCRL-13965] N79-32544
BRILLOUIN EFFECT
Brillouin backscatter dependence upon pulse amplitudes, timing, target material and geometry
[AD-A070300] N79-33037
BRILLOUIN ZONES
Axially-dependent equilibrium of an unneutralized electron beam in an axial magnetic field
[AD-A070592] N79-33040
BROADBAND
Calculation and construction of wide band far infrared filters [MPE balloon telescope]
[MPI-PAE/EXTRATERR-146] N79-33024
Wide bandwidth liquid crystal light valve --- interface for coherent optical data processing
[AD-A070675] N79-33083
BRONZES
Galvanic corrosion of piping and fitting alloys in sulfide-modified seawater
[AD-A070677] N79-32333
BROWNIAN MOVEMENTS
Laser Doppler electrophoresis and the mobility of colloidal particles
N79-32297
BUBBLE TECHNIQUE
Horizontal Bloch line motion in magnetic bubble materials
N79-33068
BUCKLING
Inplane and out of plane buckling of thick rings subjected to hydrostatic pressure
N79-32573
BUFFER STORAGE
Electronic processing of infrared scanner signals using CCD memory techniques
[NLR-MP-78031-U] N79-32623
BUILDINGS
Passive solar heating for buildings
[LA-UR-78-427] N79-32706
BULGING
Exploratory study of the dynamic fracture ductility of TRIP and 300M steels
[AD-A069909] N79-32338
BURNTHROUGH [FAILURE]
Newly discovered failure mode in high energy density, energy storage capacitors
[LA-7376-MS] N79-32728
BUTANES
Development of combustion data to utilize low-Btu gases as industrial process fuels. Project 8985 special report no. 3, nozzle-mix burner
[FE-2489-31] N79-32380
Thermodynamic and transport properties of isobutane: A survey of available data
[COO-4051-35] N79-33096

C

CADMIUM SULFIDES
Cadmium sulfide-copper sulfide heterojunction cell research
[SAN-1459-3] N79-32701
CALIBRATING
Navaid calibration evaluation with a computer controlled avionics data acquisition system
[NLR-MP-78030-U] N79-32193
A damped flat-plate coupler for use in calibrating circumaural earphones
[NPL-AC-90] N79-32452
Wavelength repeatability of a Cary model 14 R spectrophotometer
[AD-A070704] N79-32528
Results of the 1978 NASA/JPL balloon flight solar cell calibration program
[NASA-CR-162298] N79-32635
CALIFORNIA
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model --- Los Angeles, California and St. Louis, Missouri
[E79-10269] N79-32604
CALORIMETERS
Modular calorimeter system for use in high energy physics
[COO-3071-239] N79-32994
CAMBERED WINGS
Wind tunnel tests on cambered wings of mild gothic planform. Part 1: Further low speed tests. Part 2: Transonic tests
[ARC-R/M-3827] N79-32179
CAMERA TUBES
Development of suitable semi-conductor-evaporated coatings for a color-striped vidicon for a single tube color camera
[BMFT-FB-T-78-39] N79-33025
CANADA
Management of radioactive fuel wastes: The Canadian disposal program
[AECL-6314] N79-33000
CAPACITANCE
Capacitance transients in p-type GaAs MOS structures and application to lifetime mapping during solar cell fabrication
N79-32668
The enlargement of fast avalanche photodiode bandwidths by capacitance compensation
[IPF-77-3] N79-33060
CAPACITORS
Capacitance transients in p-type GaAs MOS structures and application to lifetime mapping during solar cell fabrication
N79-32668
Newly discovered failure mode in high energy density, energy storage capacitors
[LA-7376-MS] N79-32728
CAPILLARY TUBES
Nanogram techniques. 2: Microscale preparative gas chromatography
[NRC/CNR-TT-1951] N79-32304
Nanogram techniques. 1: Injection without losses on capillary columns
[NRC/CNR-TT-1950] N79-32305
CARBIDES
The effects of composition and carbide precipitation of temper embrittlement of 2 1/4 Cr-1 Mo steels
N79-32322
CARBON
Electroanalytical applications of reticulated vitreous carbon electrodes
N79-32296
CARBON DIOXIDE LASERS
Development of tunable high pressure CO2 laser for lidar measurements of pollutants and wind velocities, January 1976 to December 1977
[NASA-CR-3175] N79-32540
CO2 laser annealing of 50-microns-thick silicon solar cells
N79-32659
CARBON FIBER REINFORCED PLASTICS
Elevated-temperature application of the IITRI compression test fixture for graphite/polyimide filamentary composites
[NASA-TP-1496] N79-32277
Scanning electron microscopy of fracture surfaces of carbon composite materials
[NLR-TR-76035-U] N79-32280
Residual strength properties of carbon/epoxy composite materials --- airframe materials
[NLR-TR-77039-U] N79-32281
Environmental fatigue crack propagation in metal/composite laminates
[NLR-MP-78027-U] N79-32283
Determination of the thermal conductivity of carbon fiber reinforced plastic sheet material
[NLR-TR-77113-U] N79-32284
Thermal conductance measurement of honeycomb sandwich panels with carbon fiber reinforced plastic face sheets
[NLR-TR-78081-U] N79-32285
Nondestructive measurement of fiber direction and fiber amount in carbon fiber reinforced laminates
[FOA-C-20306-F9] N79-32286
Residual strength of [0, + or - 45] sub s and [+ or - 45, 0] sub s carbon/epoxy laminates --- fatigue loading tests
[NLR-TR-77115-U] N79-32287

Environmental fatigue crack propagation in metal/composite laminates --- flight simulation tests
[NLR-TR-77122-U] N79-32288
Residual strength of Kevlar-carbon/epoxy hybrid composite materials
[NLR-TR-78008-U] N79-32289

CARBON FIBERS
Investigation of the length dependency of carbon fibers and the related unidirectional composite strength --- fracture load tests
[NLR-TR-78050-U] N79-32291

CARBON MONOXIDE
Reduction of nitric oxide by carbon monoxide over a silica supported platinum catalyst: Infrared and kinetic studies
[LBL-8007] N79-32312
A study of homogeneous reduction of carbon monoxide to hydrocarbons and methanol
N79-32368
Fuels from magma: A potential energy source --- producing hydrogen, carbon monoxide, and methane
[SAND-78-0191] N79-32373
A model for diffuse interstellar clouds: Improvements to the theory of molecular hydrogen photodestruction and to the gas phase chemistry of carbon monoxide
N79-33130

CARBON STEELS
Residual stresses in ground steels
[AD-A070798] N79-32584

CARBON 13
The cosmic ray boron and carbon isotopic composition measured in nuclear emulsions
[LUIP-7906] N79-33149

CARBONACEOUS CHONDRITES
Retrieval of asteroidal materials
N79-32234

CARRIER FREQUENCIES
An 800 MHz communications survey of the Los Angeles area
[PB-295043/4] N79-32456

CASE HISTORIES
A proposal for the use of new parallel multiplication and division algorithms, modeled after Egyptian and Babylonian prototypes
[CTH-MATH-1979-5] N79-32933

CAST ALLOYS
Low cycle fatigue properties of MAR-M-246 Hf in hydrogen --- a cast nickel-base alloy
[NASA-CR-161296] N79-32324

CASTING
Cast titanium compressor casting
[AD-A071051] N79-32335

CATALYSIS
Screening of zeolite catalysts for methanol conversion to light hydrocarbons
[COO-4691-1] N79-32386

CATALYSTS
Fixed bed methanation processes
[FE-2240-96] N79-32382

CATIONS
Binding of anionic dyes to cation-specific poly [crown ethers]
N79-32356

CAVITATION CORROSION
Deformation twinning and its role in the cavitation erosion response of HCP Co single crystals
N79-33078

CAVITIES
A mathematical analysis of the rotary piercing process
N79-32548

CELESTIAL MECHANICS
Planetary data system requirements: Multi-mission radio science requirements for the 1978 to 1988 era
[NASA-CR-162306] N79-33139
Nutation of Mars
[NASA-CR-162300] N79-33140

CENTER OF PRESSURE
Calculation of subsonic normal force and centre of pressure position of bodies of revolution using a slender body theory: Boundary layer method
[WSRL-0093-TR] N79-32160

CENTRAL PROCESSING UNITS
Analysis and design of pipelined processors
N79-32846
An experimental natural-language processor for generating data type specifications
N79-32847

CENTRIFUGAL CASTING
Cast titanium compressor casting
[AD-A071051] N79-32335

CENTRIFUGES
Optimum axial flow taper in a countercurrent gas centrifuge
[K/OA-4445] N79-32504

CERAMICS
Nucleation and growth of cracks in CVD ZnS under particle impact, part 2
[AD-A069528] N79-32364
Performance of ceramic materials in high temperature steam and hydrogen
[BNL-25812] N79-32367
Ceramic heat pipes for high temperature heat removal
[LA-UR-79-332] N79-32518
Evaluation of cellular glasses for solar mirror panel applications
[NASA-CR-162303] N79-32634
Advanced optical ceramics, phase 1
[AD-A070909] N79-33019

CHALCOGENIDES
Optical versus transport processes in chalcogenide glasses
[AD-A070927] N79-32360

CHANNEL FLOW
Large eddy simulation of turbulent channel flow: ILLIAC 4 calculation
[NASA-TM-78619] N79-32152
User's manual for codes CHLG and CHTS: Steady incompressible viscous flow in two-dimensional channels
[AD-A069584] N79-32513

CHANNELS [DATA TRANSMISSION]
Description of STIDAS 2-c [Speech Transmission Index Device using Artificial Signals]. Part 1: General description
[IZF-1978-19] N79-32450
A physical method for measuring speech-transmission quality
[IZF-1979-1] N79-32451

CHARACTERIZATION
Growth characteristics of a through crack in a plate of finite thickness
N79-32568
Heliostat beam characterization system
[SAND-79-0697C] N79-32703

CHARGE COUPLED DEVICES
Electronic processing of infrared scanner signals using CCD memory techniques
[NLR-MP-78031-U] N79-32623
Wide bandwidth liquid crystal light valve --- interface for coherent optical data processing
[AD-A070675] N79-33083

CHARGE EXCHANGE
Vibrational energy transfer in selectively excited diatomic molecules
[LBL-8208] N79-32987
Properties of multistep amplitudes in charge-exchange reactions
[UCRL-82665] N79-33002

CHARGED PARTICLES
On the electrically stimulated filtration of aerosols -- - the effects of fiber shape on charged particles
N79-32300

CHEBYSHEV APPROXIMATION
On numerical analysis in semi-infinite programming
[TRITA-NA-79-07] N79-32887
Approximation of e exponent -x by rational functions with concentrated negative poles
[CTH-MATH-1979-9] N79-32936

CHEMICAL ANALYSIS
Applications of chemical reactions to the determination of trace quantities of organic functional groups
N79-32264

CHEMICAL COMPOSITION
The effects of composition and carbide precipitation of temper embrittlement of 2 1/4 Cr-1 Mo steels
N79-32322

CHEMICAL EVOLUTION
Nucleosynthesis in supernovae and the origin of isotopic heterogeneity in the early solar system
N79-33126

CHEMICAL PROPERTIES
Stability of the lanthanide hydrides
[LA-7602-MS] N79-32991

CHEMICAL PROPULSION
Aspects of the performance of chemical rocket thrust systems
[TUM-LRT-RT-TB-78/3] N79-32263

CHEMICAL REACTIONS
Applications of chemical reactions to the determination of trace quantities of organic functional groups
N79-32264
Production of high-energy chemicals using solar energy heat
[ORNL/SUB-7390/1] N79-32707
Shock tube studies of reaction and energy transfer rates between molecules and reactive atoms
N79-32980
The formation of reactive intermediates in rare-gas matrices and a study of the interactions involved in proton rare-gas clusters
N79-32982

CHEMICAL REACTORS
Fixed bed methanation processes
[FE-2240-96] N79-32382

CHEMILUMINESCENCE
Infrared chemiluminescence studies of ion-molecule reactions in a flowing afterglow
[AD-A070068] N79-32309

CHIRP SIGNALS
Transient behavior of the LMS adaptive filter-response to variable frequency spectral lines
[AD-A070470] N79-32470

CHLOROFORM
Ultraviolet absorption spectrum of methylchloroform in the vapor phase
[AERONOMICA-ACTA-A-203-1979] N79-32766

CHROMIUM STEELS
The effects of composition and carbide precipitation of temper embrittlement of 2 1/4 Cr-1 Mo steels
N79-32322

CIRCUIT BREAKERS
Reliability analysis and optimum maintenance scheduling of molded-case circuit breakers
N79-32461

CIRCUIT DIAGRAMS
Device model for FETSIM circuit simulation program
[NASA-CR-150321] N79-32465

CIRCUIT PROTECTION
Feasibility study of silicon nitride protection of plastic encapsulated semiconductors
[NASA-CR-161302] N79-32266

CITIES
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model --- Los Angeles, California and St. Louis, Missouri
[E79-10269] N79-32604

CIVIL AVIATION
Trends in the air service provided by certificated carriers: 1938-1977
[PB-295190/3] N79-32184

CLADDING
Long-term storage of irradiated CANDU fuel under water
[AECL-6313] N79-32999

CLEANERS
Effects of noncontact cleaners on transparent solar materials
[PNL-2969] N79-32709

CLIMATE
The effect of solar output, infrared cooling and latitudinal heat transport on the evolution of the earth's climate
[AERONOMICA-ACTA-A-200-1979] N79-32794
Some evolution and stability trends deduced from energy and water vapor balance models
[AERONOMICA-ACTA-A-201-1979] N79-32795

CLIMATOLOGY
Urbanization and its effects on the climate of Phoenix
N79-32740
Earth Radiation Budget Science, 1978 --- conferences
[NASA-CP-2100] N79-32797
Climate modeling --- for use in understanding earth's radiation budget
N79-32799
Climate diagnostics --- using radiation and meteorological data for diagnosing climatic fluctuations
N79-32800
Wind power climatology of the United States, supplement
[SAND-78-1620] N79-32811

CLOSED CIRCUIT TELEVISION
Evaluation of echo suppression in video teleconferencing via the communications technology satellite
[PB-294965/9] N79-32455

CLOUD COVER
Cloudiness and the radiation budget
N79-32803

CLOUD PHYSICS
Infinite cloud model of electrification by the precipitation mechanism in the presence of high rates of ion generation
[UCRL-13860] N79-32774
Earth Radiation Budget Science, 1978 --- conferences
[NASA-CP-2100] N79-32797
Climate modeling --- for use in understanding earth's radiation budget
N79-32799
A model for diffuse interstellar clouds: Improvements to the theory of molecular hydrogen photodestruction and to the gas phase chemistry of carbon monoxide
N79-33130

CLUTTER
Measurements of bistatic clutter cross section
[AD-A071193] N79-32428

CMOS
Silicon-gate CMOS/SOS processing
[NASA-CR-150319] N79-32464
Expansion of CMOS array design techniques
[NASA-CR-150318] N79-32628

COAL
Methane recovery from coalbeds project technology test projects evaluation of candidate projects
[DOE/TIC-10128] N79-32390
Assessment of surface runoff from iron and steel mills
[PB-294981/6] N79-32756

COAL GASIFICATION
Fixed bed methanation processes
[FE-2240-96] N79-32382
Research and development work for hydrogasification of coal with nuclear processing heat done in the

framework of the prototype nuclear processing heater project
[BMFT-FB-T-78-25] N79-32393
Research and development concerning steam gasification of coal: Report on the concept of a prototype plant using nuclear processing heat
[BMFT-FB-T-78-29] N79-32394
COAL LIQUEFACTION
Recent developments in coal liquefaction in the United States --- conferences
[CONF-790213-5] N79-32383
COAL UTILIZATION
Impacts of the Resource Conservation and Recovery Act on the siting of coal-conversion energy facilities in the United States
[ORNL/OEPA-12] N79-32724
COASTAL CURRENTS
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609
COASTAL WATER
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609
COASTS
Basic remote sensing investigation for coastal reconnaissance
[AD-A070770] N79-32615
COATINGS
Lunar building materials: Some considerations on the use of inorganic polymers --- adhesives, coatings, and binders N79-32238
A study of wire coating extrusion N79-32396
COBALT
The 150 KVA samarium cobalt USCF starter generator electrical system
[AD-A070078] N79-32468
Deformation twinning and its role in the cavitation erosion response of HCP Co single crystals N79-33078
COCHLEA
Effects of acute noise traumata on whole-nerve and single-unit activity
[IZF-1978-23] N79-32829
COCKPITS
Cockpit displays of traffic information: Airline pilots opinions about content, symbology, and format
[NASA-TM-78601] N79-32185
CODERS
Spectral characteristics of convolutionally coded digital signals
[NASA-CR-162295] N79-32412
COGNITION
Shalit Perceptual Organization and Reduction Questionnaire [SPORQ]. Report 2: Characteristics and reliability
[FOA-C-55031-H6] N79-32836
COHERENT LIGHT
Wide bandwidth liquid crystal light valve --- interface for coherent optical data processing
[AD-A070675] N79-33083
COKE
Assessment of surface runoff from iron and steel mills
[PB-294981/6] N79-32756
COLD CATHODES
An ion source plasma starting from a cold LaB6 cathode I
[IPPJ-406] N79-33031
COLD PLASMAS
Competition of weakly collisional and neighboring wave effects for the destruction of amplitude oscillations
[IPPJ-407] N79-33030
COLLISIONAL PLASMAS
Competition of weakly collisional and neighboring wave effects for the destruction of amplitude oscillations
[IPPJ-407] N79-33030
COLLISIONLESS PLASMAS
The magnetic field structure on the magnetosphere boundary
[PR-440] N79-32781
Simulation of cometary magnetic tails
[PR-439] N79-33143
COLLOCATION
On the use of spline functions and collocation in a trajectory optimization algorithm based on mathematical programming
[NLR-TR-78016-U] N79-32926
COLLOIDS
Laser Doppler electrophoresis and the mobility of colloidal particles N79-32297
COLOR PHOTOGRAPHY
Georgia from space: An explanation of the NASA LANDSAT 1 satellite image color mosaic of the state of Georgia
[CIRC-787] N79-32613
COLOR TELEVISION
Development of suitable semi-conductor-evaporated coatings for a color-striped vidicon for a single tube color camera
[BMFT-FB-T-78-39] N79-33025
COLOR VISION
Recognition of the aircraft navigation light colour code N79-32186
COLUMBIA RIVER BASIN [ID-OR-WA]
Survey of the ground-water geology and hydrology of the Pasco Basin, Washington --- waste disposal potential
[RHO-BWI-C-41] N79-32616
COMBINATORIAL ANALYSIS
Diameters of random graphs
[AD-A070099] N79-32916
Random bipartite graphs: Connectedness, isolated nodes, diameters
[AD-A070100] N79-32917
COMBUSTION
Computational nature of combustion modeling
[SAND-78-8245] N79-32313
COMBUSTION CHAMBERS
An investigation of flame stability in a coaxial dump combustor N79-32209
Lean, premixed, prevaporized fuel combustor conceptual design study
[NASA-CR-159647] N79-32211
Computational nature of combustion modeling
[SAND-78-8245] N79-32313
Influence of turbulence on hydrocarbon combustion in a stirred combustor
[ONERA-NT-1978-7] N79-32315
Liquid fuel jet injection into a simulated subsonic dump combustor
[AD-A071028] N79-32509
COMBUSTION EFFICIENCY
Development of combustion data to utilize low-Btu gases as industrial process fuels. Project 8985 special report no. 3, nozzle-mix burner
[FE-2489-31] N79-32380
COMBUSTION PHYSICS
Early formation of nitrogen oxides during combustion of hydrocarbons
[ONERA-NT-1978-4] N79-32314
COMBUSTION PRODUCTS
Measured effects of boundary conditions on oxides of nitrogen produced by liquid fuel diffusion flames N79-32302
COMBUSTION STABILITY
Combustion of uniformly sized droplet sprays in a refractory tube N79-32299
COMET TAILS
Simulation of cometary magnetic tails
[PR-439] N79-33143
COMETS
Models of P/Tempel 2
[NASA-CR-162292] N79-33138
COMMAND AND CONTROL
Technical assistance for law-enforcement communications: Grant summary
[NASA-CR-162305] N79-32411
Command and control related computer technology: Packet radio
[AD-A070447] N79-32430
Combined discrete network: Continuous control modeling of man-machine systems
[AD-A071574] N79-32842
COMMERCIAL AIRCRAFT
Trends in the air service provided by certificated carriers: 1938-1977
[PB-295190/3] N79-32184
Commercial aircraft flight deck noise criteria
[AD-A072029] N79-32969
COMMITTEE ON SPACE RESEARCH
European space activities
[SP-1014] N79-32242
Space activity in Austria, 1978/79 N79-32249
COMMUNICATION CABLES
Low cost fiber optic cable assemblies for local distribution systems
[AD-A070723] N79-33022
COMMUNICATION EQUIPMENT
Robust optimal systems in radar and communications N79-32406
Ferrites with anomalous hysteresis loops for communication systems
[BMFT-FB-T-78-54] N79-32488
COMMUNICATION NETWORKS
Command and control related computer technology: Packet radio
[AD-A070447] N79-32430
Distributed sensor networks
[AD-A070455] N79-32438
Optimization of future telecommunication network structures
[BMFT-FB-T-78-55] N79-32448
Biomedical communications experiments using the communications technology satellite: Executive summary
[PB-294405/6] N79-32459
COMMUNICATION SATELLITES
Military satellite communications, history and status as of 1974
[NRL-TR-74173-U] N79-32254
Predicting transionospheric propagation conditions
[AD-A070283] N79-32421
Evaluation of echo suppression in video teleconferencing via the communications technology satellite
[PB-294965/9] N79-32455
COMMUNICATION THEORY
Definition and verification of computer network protocols
[NPL-DNACS-15/79] N79-32885
COMMUNICATIONS TECHNOLOGY SATELLITE
Biomedical communications experiments using the communications technology satellite: Executive summary
[PB-294405/6] N79-32459
COMMUNITIES
A summation and inhibition model of annoyance response to multiple community noise sources
[NASA-TP-1479] N79-32744
COMMUTATION
Torsion theories with the bounded splitting property --- limited to commutative rings N79-32963
COMPILERS
Automatic storage optimization --- compiler N79-32848
COMPLEX SYSTEMS
Theoretical and computational aspects of reliability indices for large scale systems N79-32558
COMPONENT RELIABILITY
Light emitting diodes. A comparative 10,000 hour service test of light emitting diodes, including 26 variants from 15 manufacturers
[ECR-85] N79-32566
COMPOSITE MATERIALS
Research Workshop on Mechanics of Composite Materials N79-32267
The viscoelastic response of composite materials N79-32268
Plasticity of composite laminates N79-32269
Continuum modeling of damage accumulation and ultimate failure in fiber reinforced laminated composite materials N79-32270
Boundary layer effects in composite laminates N79-32271
Characteristic damage states in composite laminates N79-32273
A high-order theory of laminated plate deformation N79-32274
Formation and properties of rubber-modified epoxies N79-32357
Photoelastic studies of advanced lap joint concept
[NASA-CR-162316] N79-32575
COMPOSITE STRUCTURES
Mathematical modeling and micromechanics of fiber-reinforced bimodulus composite materials
[AD-A071389] N79-32278
Investigation of penetration of electromagnetic energy through joints in advanced composite structures --- aircraft structures
[AD-A069589] N79-32441
COMPRESSIBILITY EFFECTS
Effect of compressibility, suction, and heat transfer on the nonparallel stability of boundary-layer flows N79-32494
COMPRESSING
Compression of toroidal plasma by imploding plasma-liner
[IPPJ-408] N79-33032
Design and analysis of isentropic compression experiments
[UCRL-81797] N79-33097
COMPRESSION TESTS
Elevated-temperature application of the IITRI compression test fixture for graphite/polyimide filamentary composites
[NASA-TP-1496] N79-32277
COMPRESSOR BLADES
Theoretical studies of three dimensional transonic flow through a compressor blade row
[AD-A071020] N79-32172
COMPUTATION
Calculation and construction of wide band far infrared filters [MPE balloon telescope]
[MPI-PAE/EXTRATERR-146] N79-33024
COMPUTER GRAPHICS
Survey and evaluation of potential real-time interactive flight test facilities for the B-1
[AD-A070343] N79-32222
Spatial data management system
[AD-A070243] N79-32853

Computer display set AN/UYQ-21 TECHEVAL test. System meets all specifications and is judged to be suitable for OPEVAL
[AD-A070260] N79-32857
Decomposition of weighted graphs using the interchange partitioning technique
[AD-A069549] N79-32859

COMPUTER NETWORKS
Computer networks
[AD-A070223] N79-32423
A contribution to diffusion theory with applications
N79-32893

COMPUTER PROGRAMMING
Contributions to the 'Data Systems Engineering in Space Travel' Symposium --- Germany, Jan. 1978
[DLR-MITT-78-02] N79-32243
User's manual for SCWAR: A multiwire shielded cable code for a systems oriented EMP vulnerability assessment program
[AD-A070884] N79-32427
The performance of a vectorized 3-D Navier-Stokes code on the CRAY-2 computer
[AD-A071137] N79-32510
Distributed computer systems: Structure and semantics
[AD-A070286] N79-32879
Structured programming in a database environment
[AD-A070270] N79-32881
Global and superlinear convergence of a class of variable metric methods
[AD-A070204] N79-32959

COMPUTER PROGRAMS
Time history solution program, L225 [TEV126]. Volume 1: Engineering and usage
[NASA-CR-2859] N79-32161
Random harmonic analysis program, L221 [TEV156]. Volume 2: Supplemental system design and maintenance document
[NASA-CR-2858] N79-32162
A program to compute three-dimensional subsonic unsteady aerodynamic characteristics using the doublet lattic method, L216 [DUBFLX]. Volume 1: Engineering and usage
[NASA-CR-2849] N79-32163
Modal interpolation program, L215 [INTERP]. Volume 1: Engineering and usage
[NASA-CR-2847] N79-32164
Helicopter flow field analysis
[AD-A069542] N79-32174
Computer automation of continuous-flow analyzers for trace constituents in water. Volume 4: Description of program segments. Part 1: TAAIN
[UCRL-52532-VOL-4-PT-1] N79-32310
Command and control related computer technology: Packet radio
[AD-A070447] N79-32430
Simulation of communications systems for TV transmission, exchange of radio programs, and long-distance telephony
[BMFT-FB-W-78-27] N79-32445
ADINC: An implicit Lagrangian hydrodynamics code
[AD-A070361] N79-32503
User's manual for codes CHLG and CHTS: Steady incompressible viscous flow in two-dimensional channels
[AD-A069584] N79-32513
A computer method for calculating the radiative interchange factors in a complex enclosure and an extension of the method to the calculation of the incident flux distribution
[CNES-NT-89] N79-32520
Designing tubular heat exchangers using an interactive computer program
[CRIF-MT-131] N79-32521
Development of a viscous theory of three-dimensional flow in highly-loaded axial turbomachines
[AD-A071049] N79-32554
Numerical analysis --- analysis methods for pressure vessesl
N79-32580
Stress analysis of cylindrical pressure vessels with closely spaced nozzles by the finite-element method. Volume 2: Vessels with two nozzles under external force and moment loadings
[NUREG-CR-0132] N79-32590
The dynamic analysis of structures: A comparison between two different versions of STRUDL 2
N79-32599
A fast routine for computing
[NASA-TM-78133] N79-32612
Expansion of CMOS array design techniques
[NASA-CR-150318] N79-32628
Combined photovoltaic/thermal system studies
[SAND-78-7031] N79-32691
Demonstration of the capabilities of the Livermore energy policy model
[UCRL-52508] N79-32695
Heat pump/rock bed storage systems --- computer program for economic analysis
[COO-4704-2] N79-32705
Review of unfolding methods used in the US and their standardization for dosimetry
[BNWL-SA-6503] N79-32828
A simulation technique for enhancing CODASYL database implementations
N79-32850
A program verifier and proof of the correctness of a flight director program
N79-32864
Dynamic multilevel simulation
N79-32872
Implementation and evaluation of interval arithmetic software. Report 3: The Honeywell G635 system
[AD-A070374] N79-32878
Software reliability determination and prediction
[AD-A069976] N79-32880
PROCOPES [Conversational Program for Signal Processing]: Evolution toward an interpretative command language
[ONERA-NT-1978-8] N79-32883
A brief guide to NPL Algorithms Library, 1979
[NPL-CSU-3/79] N79-32884
A comparison of the existence theorems of Kantorovich and Moore
[AD-A070203] N79-32908
SLINEQ: A code to solve systems of linear equations and inequalities
[SAND-78-1442] N79-32925
Risk assessment for radioactive waste disposal
[AECL-6322] N79-33001
The integrated computer database as a medium for the management and access of textual information
N79-33099
User's guide to program MAD: A computer program for the organization and manipulation of magnetic tape directories
[ORNL/TM-6597] N79-33102

COMPUTER STORAGE DEVICES
The effect of program behavior upon interleaved memory bandwidth in a multiprocessor environment
[AD-A070115] N79-32855
Archival storage requirements
[UCRL-82513] N79-33103

COMPUTER SYSTEMS DESIGN
The conclave computer teleconferencing system
[NPL-COM-107] N79-32446
Survey of biomedical and environmental data bases, models, and integrated computer systems at Argonne National Laboratory
[ANL/ES-65] N79-32745
Analysis and design of pipelined processors
N79-32846
Decomposition of weighted graphs using the interchange partitioning technique
[AD-A069549] N79-32859
A statistical methodology for constructing synthetic test workloads
N79-32865
Groups with solvable word problems
N79-32868
Software design and documentation language, revision 1
[NASA-CR-162291] N79-32875
Elements of a theory of computer systems
N79-32890
High performance computer systems
[UCID-17914] N79-32891

COMPUTER SYSTEMS PROGRAMS
The NPL implementation of level 2 of the X25 interface
[NPL-DNACS-18/79] N79-32862
Software design and documentation language, revision 1
[NASA-CR-162291] N79-32875
Phased models for evaluating the performability of computing systems
[NASA-CR-162317] N79-32876
METAPHOR [version 1]: Users guide --- performability modeling
[NASA-CR-162322] N79-32877
Definition and verification of computer network protocols
[NPL-DNACS-15/79] N79-32885
Design of software tools for microprogrammable microprocessors
[TRITA-NA-79-03] N79-32886
Elements of a theory of computer systems
N79-32890
Performability modeling with continuous accomplishment sets
[NASA-CR-162323] N79-32906

COMPUTER TECHNIQUES
Computer automation of continuous-flow analyzers for trace constituents in water. Volume 4: Description of program segments. Part 1: TAAIN
[UCRL-52532-VOL-4-PT-1] N79-32310
Dynamic multilevel simulation
N79-32872
Dynamic reassignment in distributed processing systems
N79-32888

COMPUTERIZED DESIGN
Designing tubular heat exchangers using an interactive computer program
[CRIF-MT-131] N79-32521
Expansion of CMOS array design techniques
[NASA-CR-150318] N79-32628

COMPUTERIZED SIMULATION
Powered-lift aircraft handling qualities in the presence of naturally-occurring and computer-generated atmospheric disturbances
[AD-A072118] N79-32198
Standalone engine simulator [SAES], Engine Dynamics simulator [EDS] Xerox Sigma 5 interface hardware manual
[NASA-CR-161301] N79-32213
Computer modeling of film growth and resistance estimation of semi-continuous metal films
N79-32317
Automated digital system engineering model
[PB-294960/0] N79-32457
Heat balance research with a thin-walled cube in a simulated space environment --- satellite design criteria
[NLR-TR-78080-U] N79-32522
Streamflow simulation studies of the Hillsbrough Alafia, and Anclote rivers, west central Florida
[PB-295569/8] N79-32626
Computerized pattern recognition applied to Ni-Cd cell lifetime prediction
[AD-A070344] N79-32675
Description of the 3-dimensional 2-phase simulator SHAFT78 for use in geothermal reservoir studies --- mass and energy balance for two phase flow in porous media
[LBL-8802] N79-32684
Cross-field electron heat transport due to high frequency electrostatic waves
[IPPJ-405] N79-33029
Simulation of lower-hybrid heating in a nonuniform plasma slab
[AD-A070491] N79-33041

COMPUTERS
Computer modeling of a two-junction, monolithic cascade solar cell
N79-32672
A statistical methodology for constructing synthetic test workloads
N79-32865
Archival storage requirements
[UCRL-82513] N79-33103

CONCAVITY
Analytic approximation of concave functions
[CTH-MATH-1979-2] N79-32931

CONCENTRATION [COMPOSITION]
A geologic assessment of potential lunar ores
N79-32239
Recent measurements of the rates of ozone removal from the atmosphere by land surfaces --- agricultural land
[CONF-780636-11] N79-32748
Temperature, molecular nitrogen concentration and turbulence in the lower thermosphere inferred from incoherent scatter data
[AERONOMICA-ACTA-A-204-1979] N79-32767
Some linear differential equation problems in the analysis of dissolved species in cracks
[NPL-DNACS-14/79] N79-32927

CONCENTRATORS
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 1: Study overview and summary
[NASA-CR-162328] N79-32638
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 2: Technical
[HAC-REF-E3256-VOL-2] N79-32639

CONCRETES
Recycling of asphalt concrete airfield pavement: A laboratory study
[AD-A072117] N79-32218
Prestressed concrete pressure vessels: Conceptual design/economic, executive summary
[FE-1775-19] N79-32591

CONDENSATES
Laminar condensation phenomenon associated with a moving droplet
N79-32495

CONDENSERS [LIQUIFIERS]
Condensation of refrigerants on vertical fluted tubes
[ORNL/TM-5848] N79-32515

CONFERENCES
Factor of safety - USAF design practice --- conferences
[AD-A070237] N79-32183
Contributions to the 'Data Systems Engineering in Space Travel' Symposium --- Germany, Jan. 1978
[DLR-MITT-78-02] N79-32243
Research Workshop on Mechanics of Composite Materials
N79-32267
Recent developments in coal liquefaction in the United States --- conferences
[CONF-790213-5] N79-32383
Experience with installation and operation of digital electronic balances --- conferences
[LA-UR-79-1029] N79-32530
Proceedings of the ARPA/AFML Review of Progress in Quantitative Nondestructive Evaluation
[AD-A071047] N79-32563

Solar Cell High Efficiency and Radiation Damage, 1979
[NASA-CP-2097] N79-32640
Earth Radiation Budget Science, 1978 --- conferences
[NASA-CP-2100] N79-32797
Proceedings of the 8th Technical Exchange Conference
[AD-A070009] N79-32806
Proceedings of the 4th US-German Urban Transportation Workshop
[PB-294972/5] N79-33113

CONGRESSIONAL REPORTS
Report to the Congress on ocean dumping research. Public law 92-532, title 2, section 201
[NOAA-S/T-77-2838] N79-32741
The 16 air and water pollution issues facing the nation: Appendix to report
[CED-78-148C-APP-1] N79-32742
Aeronautics and space report of the President, 1978 activities N79-33115

CONICAL BODIES
Some aerodynamic performance calculations on missile configurations
[AD-A070433] N79-32168
Heat-transfer measurements on a 5-deg sharp cone using infrared scanning and on-board discrete sensor techniques
[AD-A070363] N79-32169

CONSERVATION LAWS
Development of random choice numerical methods for blast wave problems
[AD-A071156] N79-32439

CONSTRAINTS
Variational principles for problems with linear constraints. Prescribed jumps and continuation type restrictions
[AD-A070199] N79-32919

CONSTRUCTION
Construction problems for high Reynolds number wind tunnel models
[ONERA-NT-1978-6] N79-32224

CONTACT RESISTANCE
Determination of the thermal conductivity of carbon fiber reinforced plastic sheet material
[NLR-TR-77113-U] N79-32284

CONTENT
Nondestructive measurement of fiber direction and fiber amount in carbon fiber reinforced laminates
[FOA-C-20306-F9] N79-32286

CONTINENTAL SHELVES
Development of multifunctional sea-floor instrumental systems
[SAND-78-0781C] N79-32820
Winter circulation and hydrography over the continental shelf of the north gulf of Alaska
[PB-296914/5] N79-32821

CONTINUITY (MATHEMATICS)
Performability modeling with continuous accomplishment sets
[NASA-CR-162323] N79-32906
On recurrence of a random walk in the plane
[CTH-MATH-1979-4] N79-32932
On coupling of continuous time renewal processes
[CTH-MATH-1979-11] N79-32937

CONTROL CONFIGURED VEHICLES
A theoretical investigation of power and control configurations for a high g-onset centrifuge drive system
[AD-A070912] N79-32841

CONTROL EQUIPMENT
Robust optimal systems in radar and communications N79-32406
Microprocessor-controlled autonomous sun-following mount for solar photovoltaic energy planning
[COO-4094-34] N79-32702
A theoretical investigation of power and control configurations for a high g-onset centrifuge drive system
[AD-A070912] N79-32841

CONTROL THEORY
Techniques for observation and control of high voltage spark discharge N79-32460
Quantitative synthesis of multiple loop feedback systems with large uncertainty
[AD-A070273] N79-32896
Numerical methods and approximation and modelling problems in stochastic control theory
[AD-A070038] N79-32898

CONVECTIVE HEAT TRANSFER
Laminar condensation phenomenon associated with a moving droplet N79-32495
The effect of solar output, infrared cooling and latitudinal heat transport on the evolution of the earth's climate
[AERONOMICA-ACTA-A-200-1979] N79-32794

CONVERGENCE
Searching for solutions of finite nonlinear systems: An interval approach N79-32903
Global and superlinear convergence of a class of variable metric methods
[AD-A070204] N79-32959
Local and superlinear convergence of a class of variable metric methods
[AD-A070208] N79-32960
On the rate of superlinear convergence of a class of variable metric methods
[AD-A070209] N79-32961

CONVERGENT-DIVERGENT NOZZLES
Analysis of two-phase flow in nozzles and turbine buckets
[AD-A070754] N79-32506

CONVOLUTION INTEGRALS
Time history solution program, L225 (TEV126). Volume 1: Engineering and usage
[NASA-CR-2859] N79-32161

COOLANTS
Water-cooled turbine blade technology study --- for gas turbines
[PB-295892/4] N79-32215

COOLING SYSTEMS
Meteorological Effects of Thermal Energy Releases (METER) program
[ORNL/TM-6248] N79-32812

COPOLYMERS
Structure-property relations of elastomeric ABA triblock copolymers N79-32355

COPPER
Development of sputtered techniques for thrust chambers
[NASA-CR-159637] N79-32326

COPPER OXIDES
Kinetics of the displacement reaction between Fe and Cu2O at temperatures between 800 and 1050 degrees C
[AD-A070664] N79-32308
Investigation of low cost solar cells based on Cu2O --- MIS solar cell theory
[PB-295888/2] N79-32737

COPPER SULFIDES
Cadmium sulfide-copper sulfide heterojunction cell research
[SAN-1459-3] N79-32701

CORONARY CIRCULATION
Oxygen delivery in the hypoxic perfused heart: Relation to functional and metabolic changes N79-32825

CORRELATION
Two-photon correlations in amplified laser light N79-32537

CORRELATION COEFFICIENTS
A Bayesian approach to random coefficient models --- using linear regression models N79-32944

CORROSION
Handling problems resulting from compressor deterioration --- in single engine jet aircraft
[NLR-MP-78019-U] N79-32214
Hydrogen permeation in iron at low temperatures
[AD-A070309] N79-32328
Galvanic corrosion of piping and fitting alloys in sulfide-modified seawater
[AD-A070677] N79-32333
Development of supercorroding alloys for use as timed releases for ocean engineering applications
[AD-A070860] N79-32334
Corrosion in molten salts used for solar thermal storage applications
[SAND-79-0246C] N79-32683

CORROSION PREVENTION
Feasibility study of silicon nitride protection of plastic encapsulated semiconductors
[NASA-CR-161302] N79-32266
Effect of an anti-corrosion penetrant on the fatigue life of various riveted joints during flight simulation tests
[NLR-TR-77103-U] N79-32350

CORROSION TESTS
Evaluation of candidate metals in a simulated space shuttle main engine environment for application as turbine blade dampers
[NASA-CR-161299] N79-32325

COSMIC DUST
An optical analysis of dust complexes in spiral galaxies N79-33129

COSMIC RAYS
Satellite observations of rapidly varying cosmic X-ray sources N79-33147

COSMOLOGY
Hubble expansion in a Euclidean framework
[TRITA-EPP-79-07] N79-33133

COST ANALYSIS
The costs and benefits of a mid-continent expansion of Loran-C
[PB-294614/3] N79-32196
Navy air-launched missile operating and support cost estimating model
[AD-A069527] N79-32251
Simulation of communications systems for TV transmission, exchange of radio programs, and long-distance telephony
[BMFT-FB-W-78-27] N79-32445
Cost-benefit analysis of selected environmental and data information service programs
[PB-297189/3] N79-32753

COST EFFECTIVENESS
Study on expenditure optimization for satellite and Spacelab experiments
[BMFT-FB-W-78-34] N79-32246
Energy and cost calculations. 1: Optimization of electrochemical processes to achieve minimum product cost and the impact on energy consumption
[ANL/OEPM-78-2] N79-32697
Cost-benefit analysis of selected environmental and data information service programs
[PB-297189/3] N79-32753

COST ESTIMATES
Avionics cost development for use of Loran-C navigation systems by low performance general-aviation aircraft
[AD-A068268] N79-32206

COST REDUCTION
Effect of environmental parameters on habitat structural weight and cost N79-32228

COUPLERS
A damped flat-plate coupler for use in calibrating circumaural earphones
[NPL-AC-90] N79-32452
Devices for fiber optics communication
[AD-A070746] N79-33023

COUPLING
On coupling of continuous time renewal processes
[CTH-MATH-1979-11] N79-32937

CRACK INITIATION
Fracture mechanics and ambient temperature sustained load fracture
[NLR-MP-78008-U] N79-32595

CRACK PROPAGATION
Environmental fatigue crack propagation in metal/composite laminates --- flight simulation tests
[NLR-TR-77122-U] N79-32288
The effect of sheet thickness on flight simulation fatigue crack propagation in 2024-T3, 7475-T761, and mill annealed Ti-6Al-4V
[NLR-MP-77024-U] N79-32345
Nucleation and growth of cracks in CVD ZnS under particle impact, part 2
[AD-A069528] N79-32364
Growth characteristics of a through crack in a plate of finite thickness N79-32568
Fracture along planar slip bands
[AD-A070788] N79-32585
X-ray diffraction measurements of crack tip stresses as a crack advances through a single overload affected zone
[AD-A070193] N79-32588
Effect of sheet metal thickness on crack propagation --- Duralumin
[ISD-240] N79-32593
Engineering application of fracture mechanics to flight simulation
[NLR-MP-78015-U] N79-32596
Gust spectrum fatigue crack propagation in candidate skin materials
[NLR-MP-78022-U] N79-32597

CRACKING (CHEMICAL ENGINEERING)
Screening of zeolite catalysts for methanol conversion to light hydrocarbons
[COO-4691-1] N79-32386

CRACKING (FRACTURING)
Three-dimensional laminate plates with through and part-through cracks N79-32276
Fatigue behavior of TiNi alloy N79-32319
Prevention of early pavement deterioration --- due to moisture in asphalt mixes, temperature susceptability, and transverse cracking
[PB-296337/9] N79-32402
Preliminary testing results for the application of a nondestructive evaluation technique utilizing the phenomenon of internal friction for detecting crack formation in a scale model of an offshore structure
[AD-A069535] N79-32564

CRACKS
Multifrequency eddy current inspection for cracks under fasteners, phase 2
[AD-A071102] N79-32560
Sixth order analyses of closure in a cracked-elastic-plastic plate
[AD-A070466] N79-32586
Apex singularities for corner cracks under opening, sliding, and tearing modes
[AD-A070200] N79-32587
Some linear differential equation problems in the analysis of dissolved species in cracks
[NPL-DNACS-14/79] N79-32927

CREEP ANALYSIS
Microstructural evaluation and non-destructive examination of 2.25 Cr-1 Mo steel
[SAND-77-1557] N79-32340

CREEP STRENGTH
The viscoelastic response of composite materials N79-32268

CRITICAL LOADING
Residual strength characteristics of composite reinforced stiffened panels --- load tests to failure
[NLR-TR-78025-U] N79-32290
CRITICAL MASS
Correlation and estimation of vapor-liquid critical properties. Part 2: Critical pressures and critical volumes of organic compounds
[NPL-CHEM-98] N79-32316
CRITICAL PRESSURE
Correlation and estimation of vapor-liquid critical properties. Part 2: Critical pressures and critical volumes of organic compounds
[NPL-CHEM-98] N79-32316
CROP INVENTORIES
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data
[E79-10283] N79-32608
CROSS CORRELATION
Correlation and estimation of vapor-liquid critical properties. Part 2: Critical pressures and critical volumes of organic compounds
[NPL-CHEM-98] N79-32316
On the description and development of large clusters of galaxies through the cluster-galaxy correlations
N79-33127
CROSS FLOW
Velocity field of a round jet in a cross flow for various jet injection angles and velocity ratios --- Langley V/STOL tunnel
[NASA-TP-1506] N79-32500
CRUDE OIL
Strategic petroleum reserve
[DOE/TIC-10107] N79-32617
Reexamination of the estimation of undiscovered oil resources in the US
[DOE/EIA-0103/31] N79-32618
Assessment of potential US petroleum supply shortfalls, 1978 - 1980
[DOE/EIA-0102/13] N79-32619
CRYOGENIC WIND TUNNELS
Review of design and operational characteristics of the 0.3-meter transonic cryogenic tunnel
[NASA-TM-80123] N79-32159
CRYOGENICS
Investigation of noise in soilds at low temperatures
[AD-A070016] N79-33086
CRYSTAL DEFECTS
Application of ion channeling to radiation damage studies --- for depth profiling of intrinsic defects in metals
[SAND-79-0497C] N79-32990
Deformation twinning and its role in the cavitation erosion response of HCP Co single crystals
N79-33078
CRYSTAL FILTERS
A photoconductive detector for the middle infrared
[BMFT-FB-W-78-32] N79-32532
CRYSTAL GROWTH
Computer modeling of film growth and resistance estimation of semi-continuous metal films
N79-32317
Exploratory development on silicon material for LADIR --- growth of gallium-doped silicon crystals
[AD-A070740] N79-33017
An investigation of factors affecting the semiconductor-to-metal transition of V[1-x]W[x]O[2]
N79-33076
Study Czochralski liquid-seal crystal growing technique
[AD-A070280] N79-33085
Epitaxial growth of semi-insulating GaAs
[AD-A071166] N79-33089
New materials properties achievable by ion implantation doping and laser processing --- for crystal regrowth by ion scattering
[CONF-781121-22] N79-33093
CRYSTAL LATTICES
Stark modulation spectroscopy of molecular crystals
N79-33066
Investigation of noise in soilds at low temperatures
[AD-A070016] N79-33086
Kinetic models for irreversible processes on a lattice
[IS-T-856] N79-33092
CRYSTAL SURFACES
A theoretical and experimental study of the thermal properties of xenon adsorbed on graphite
N79-33071
CRYSTALLIZATION
A rheo-optical study of the stress-induced crystallization of poly[ethylene terephthalate]
N79-32353
Investigation of noise in soilds at low temperatures
[AD-A070016] N79-33086
CUMULATIVE DAMAGE
Continuum modeling of damage accumulation and ultimate failure in fiber reinforced laminated composite materials
N79-32270
CURVE FITTING
Approximation of e exponent -x by rational functions with concentrated negative poles
[CTH-MATH-1979-9] N79-32936
CURVES (GEOMETRY)
A new proof of a Muentz-type theorem of Korevarr and Dixon
[CTH-MATH-1979-7] N79-32934
CYBERNETICS
Car driving as a cybernetic task
[IZF-1979-6] N79-32838
CYCLIC LOADS
Low cycle fatigue behavior of Ti-Mn alloys
N79-32321
CYCLONES
Statistical adjustment of dynamical tropical cyclone model track predictions
[AD-A070094] N79-32810
Modification of NMC analyses and prognoses for use in statistical tropical cyclone prediction models
[PB-297190/1] N79-32814
Frontal dynamics of a Gulf Stream ring --- survey of cyclonic rings
N79-32816
CYCLOTRON RESONANCE
Low pressure chemical ionization studies using rapid scan ICR spectroscopy
N79-32293
Diagnosis of the jet plasma using electron cyclotron emission
[NPL-DES-53] N79-33062
CYGNUS CONSTELLATION
Observations on V1357 Cyg = Cyg X-1. The search for the optical radiation of the accretion disk
[PR-408] N79-33124
CYLINDRICAL BODIES
Source radiation in the presence of convex bodies
[AD-A070827] N79-32440
CYLINDRICAL SHELLS
Dynamic analysis of cylindrical shells with cutouts and cracks
N79-32572
CZOCHRALSKI METHOD
Study Czochralski liquid-seal crystal growing technique
[AD-A070280] N79-33085

D

D REGION
D region amplitude distribution, cone angle of arrival, and electron density profiles
[AD-A070358] N79-32771
DAMAGE
Experimental methods for aircraft design qualifications in an exploding warhead environment
[AD-A070381] N79-32203
Characteristic damage states in composite laminates
N79-32273
DATA ACQUISITION
Navaid calibration evaluation with a computer controlled avionics data acquisition system
[NLR-MP-78030-U] N79-32193
Trials of the Doppler microwave landing system at London [Gatwick] Airport, August 1977
[RAE-TR-78124] N79-32194
Design and development of a telemetry logging system
[AD-A070310] N79-32258
PEP laser surveying system
[LBL-8412] N79-32545
Meteorological data for solar energy applications
N79-32733
HUD utilities demonstration series. Volume 9: Description of the data acquisition and instrumentation systems, Jersey City total energy project --- for energy use and energy plant operations on a building complex
[PB-294926/1] N79-32738
The 14818C Lance, missile number 3398, round no. 328 APT
[AD-A070489] N79-32809
Microprocessor as an intelligent interface between flight data acquisition equipment and a minicomputer
[NLR-MP-78007-U] N79-32861
Astronomical spectroscopy through real time computer control of photodiode array detectors
N79-33120
DATA BASES
Microwave applications processing system: A user's guide
[PB-294692/9] N79-32458
Survey of biomedical and environmental data bases, models, and integrated computer systems at Argonne National Laboratory
[ANL/ES-65] N79-32745
Update synchronization in multiaccess database systems
N79-32845
A simulation technique for enhancing CODASYL database implementations
N79-32850
Query execution in DIRECT
[AD-A070195] N79-32856
Cooperative responses from a portable natural language data base query system
N79-32867
Structured programming in a database environment
[AD-A070270] N79-32881
The integrated computer database as a medium for the management and access of textual information
N79-33099
On search performance for conjunctive queries in compressed, fully transposed ordered files
[TRITA-NA-79-08] N79-33104
DATA CONVERTERS
Some further developments of the iterative digital cellular multiplier
[NPL-DES-51] N79-32860
DATA CORRELATION
Estimation of tunnel blockage from wall pressure signatures: A review and data correlation
[NASA-CR-152241] N79-32219
Comparisons between various semi-empirical thermospheric models of the terrestrial atmosphere
[AERONOMICA-ACTA-A-199-1979] N79-32764
DATA LINKS
Modelling and system identification for the inphase/quadrature process
N79-32407
DATA MANAGEMENT
The automatic revision of storage structures
N79-32844
Spatial data management system
[AD-A070243] N79-32853
CHEOPS: A project for evaluating ANSI/SPARC architecture
[AD-A070218] N79-32854
Query execution in DIRECT
[AD-A070195] N79-32856
Structured programming in a database environment
[AD-A070270] N79-32881
DATA PROCESSING
Design and development of a telemetry logging system
[AD-A070310] N79-32258
Modelling and system identification for the inphase/quadrature process
N79-32407
Advanced training and research on satellite remote sensing techniques and applications in the United Kingdom and the United States, 1 October 1977 to 30 September 1978
[AGLT/RSU-SERIES-2/79] N79-32622
Auroral data analysis
[AD-A070180] N79-32770
Implementation and evaluation of interval arithmetic software. Report 3: The Honeywell G635 system
[AD-A070374] N79-32878
Dynamic reassignment in distributed processing systems
N79-32888
On-board transit origin-destination survey data: Expanding their use via on-line data access and analysis
[PB-294967/5] N79-33114
DATA PROCESSING TERMINALS
The NPL implementation of level 2 of the X25 interface
[NPL-DNACS-18/79] N79-32862
DATA RECORDERS
Digital recording using hologram arrays: Optical design for an experimental 100 Mbit/s recorder
[BBC-RD-1979/14] N79-32523
DATA RECORDING
Record keeping on aircraft instruments
[PB-295698/5] N79-32208
Digital recording using hologram arrays: Optical design for an experimental 100 Mbit/s recorder
[BBC-RD-1979/14] N79-32523
Low pass filtering of data recorded on magnetic tape in frequency modulated form
[ARL-MECH-ENG-NOTE-373] N79-32527
HUD utilities demonstration series. Volume 9: Description of the data acquisition and instrumentation systems, Jersey City total energy project --- for energy use and energy plant operations on a building complex
[PB-294926/1] N79-32738
DATA REDUCTION
Auroral data analysis
[AD-A070180] N79-32770
Wind power climatology of the United States, supplement
[SAND-78-1620] N79-32811
DATA SAMPLING
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data
[E79-10283] N79-32608
A comparison of sampling plans for Bayesian estimation of a Poisson process rate
[AD-A070215] N79-32948

DATA STORAGE
PCM techniques aid in storing analog data: An exact magnetic-tape storage method for analog measurement signals
[ORNL/TR-4573] N79-32529
The automatic revision of storage structures N79-32844
Automatic storage optimization --- compiler N79-32848
Flexible disk file structures for microcomputer systems N79-32851
Queues and stores with nonhomogeneous input
[AD-A069550] N79-32900
Archival storage requirements
[UCRL-82513] N79-33103

DATA SYSTEMS
Microwave applications processing system: A user's guide
[PB-294692/9] N79-32458
Some further developments of the iterative digital cellular multiplier
[NPL-DES-51] N79-32860
Planetary data system requirements: Multi-mission radio science requirements for the 1978 to 1988 era
[NASA-CR-162306] N79-33139

DATA TRANSMISSION
Devices for fiber optics communication
[AD-A070746] N79-33023

DC 9 AIRCRAFT
Wind shear during approach: An investigation into the influence of a tower measured wind environment on the symmetric motions of a simulated aircraft during an automatic approach --- DC 9 aircraft
[NLR-TR-77078-U] N79-32192

DECISION MAKING
Environmental development plan, fossil fuel utilization program
[DOE/EDP-0046] N79-32746
Effects of amphetamine on response selection and response execution processes in choice reaction tasks
[IZF-1978-8] N79-32839

DEEP SPACE
Evaluation of the JPL X-band 32 element active array --- for deep space communication
[NASA-CR-162297] N79-32409

DEFENSE COMMUNICATIONS SATELLITE SYSTEM
Military satellite communications, history and status as of 1974
[NRL-TR-74173-U] N79-32254

DEFLAGRATION
Deflagration to detonation transition behavior of aluminized HMX
[AD-A070645] N79-32371

DEFLECTORS
Safety shield for vacuum/pressure chamber viewing port
[NASA-CASE-GSC-12513-1] N79-32217

DEFORMATION
Temperature based stress analysis of notched members
[AD-A070372] N79-32589
Planar deformation of granular materials N79-33075

DEGREES OF FREEDOM
Parametrically excited nonlinear multidegree-of-freedom systems --- the parametric excitation is harmonic N79-32967

DEICING
Chemical de-icing of roads: The effect on road accidents
[VTI-145] N79-33106

DELAY
Comparison of some methods to determine the delays of landing aircraft with respect to runway capacity
[NLR-MP-77028-U] N79-32191

DELAY CIRCUITS
Modulation-delay equalisation applied to common-frequency h.f. circuits: An assessment of the likely improvement
[BBC-RD-1979/13] N79-32404

DEMAND [ECONOMICS]
Assessment of potential US petroleum supply shortfalls, 1978 - 1980
[DOE/EIA-0102/13] N79-32619
Energy Emergency Management Information System [EEMIS]: Program plan
[DOE/EIA-0135] N79-32723

DENSE PLASMAS
Numerical calculations on the propagation of microwaves in highly over-dense magnetized plasma
[IPPJ-404] N79-33028
Flux compression generators as plasma compression power sources
[LA-UR-79-1064] N79-33058

DENSITY MEASUREMENT
The mapping of Martian soil density. A comparison of albedo, topography, and geology
[PR-417] N79-33142

DENSITY WAVE MODEL
Stability of density waves in two-phase flow systems N79-32496

DEPENDENT VARIABLES
Tests for dependence
[AD-A069567] N79-32954

DEPOLARIZATION
A millimeter wave attenuation and depolarization experiment using the COMSTAR and CTS satellites
[NASA-CR-162315] N79-32442

DEPTH
Steady capillary-gravity waves on deep water N79-32759

DEPTH MEASUREMENT
Application of ion channeling to radiation damage studies --- for depth profiling of intrinsic defects in metals
[SAND-79-0497C] N79-32990

DESERT ADAPTATION
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
[E79-10271] N79-32605

DESIGN ANALYSIS
Review of design and operational characteristics of the 0.3-meter transonic cryogenic tunnel
[NASA-TM-80123] N79-32159
The design and aerodynamic characteristics of an 18% thick shock-free airfoil [NLR 7501]
[NLR-MP-78016-U] N79-32180
Prestressed concrete pressure vessels: Conceptual design/economic, executive summary
[FE-1775-19] N79-32591
Design of high efficiency HLE solar cells for space and terrestrial applications N79-32647
A review of Air Force high efficiency cascaded multiple bandgap solar cell research and development N79-32670

DESTRUCTION
Competition of weakly collisional and neighboring wave effects for the destruction of amplitude oscillations
[IPPJ-407] N79-33030

DESTRUCTIVE TESTS
Torsion tests on steels used in the manufacture of high pressure vessels
[NPL-CHEM-97] N79-32349

DESULFURIZING
Engineering study of the flue gas desulfurization unit for the power plant Weiher 3
[BMFT-FB-T-78-28] N79-32751

DETERIORATION
Prevention of early pavement deterioration --- due to moisture in asphalt mixes, temperature susceptability, and transverse cracking
[PB-296337/9] N79-32402

DETONATION
Deflagration to detonation transition behavior of aluminized HMX
[AD-A070645] N79-32371
Low detonation velocity: High energy explosives
[UCRL-80458] N79-32376
Development of a large electrically driven flyer system for explosive initiation studies
[LA-UR-78-2279] N79-32377

DEUTERIUM PLASMA
Damage of metal surfaces by a hot dense deuterium plasma --- using unipolar arcing for the study of fusion reactor materials
[COO-4393-03] N79-33057

DEVELOPING NATIONS
Systems framework for energy analysis in developing countries
[BNL-25933] N79-32722

DIALLYL COMPOUNDS
Evaluation and auger analysis of a zinc-dialkyldithiophosphate antiwear additive in several diester lubricants
[NASA-TP-1544] N79-32359

DIAMONDS
A new method for the measurement of Rockwell diamond indenters
[NPL-MOM-33] N79-32557

DIATOMIC MOLECULES
Vibrational energy transfer in selectively excited diatomic molecules
[LBL-8208] N79-32987

DICHOTOMIES
Algorithms for discovering hierarchical relationships among dichotomous items N79-32904

DIELECTRIC PROPERTIES
Asymptotic rounds for solutions to a system of damped integrodifferential equations of electromagnetic theory
[AD-A070132] N79-32432

DIELECTRICS
Investigation of the liquid-layer-on-solid sample spark technique N79-32298
Dielectrophoretic levitation of spheres and shells
[UCRL-13852-2] N79-32479

DIFFERENCE EQUATIONS
The application of difference methods in fluid mechanics
[AD-A069544] N79-32511

DIFFERENTIAL EQUATIONS
Oscillation theory of systems of ordinary differential equations N79-32901
Note on the practical significance of the Drazin inverse
[NASA-CR-162307] N79-32907
Collocation approximation to eigenvalues of an ordinary differential equation: The principle of the thing
[AD-A070197] N79-32913
An efficient method for solving stiff transient field problems arising from FEM formulations
[AD-A070085] N79-32914
Some properties of linear multistep and one-leg methods for ordinary differential equations
[TRITA-NA-79-04] N79-32939
Some stability properties of linear multistep compound discretizations of partitioned differential systems
[TRITA-NA-79-10] N79-32941
Computations related to G-stability of linear multistep methods
[TRITA-NA-79-11] N79-32942

DIFFRACTION
Source radiation in the presence of convex bodies
[AD-A070827] N79-32440

DIFFUSION
Optical detection of spectral diffusion of the triplet state zerofield transition energy --- liquid crystals
[AD-A071179] N79-33084

DIFFUSION FLAMES
Measured effects of boundary conditions on oxides of nitrogen produced by liquid fuel diffusion flames N79-32302

DIFFUSION THEORY
An analysis approach to diffusion approximations in queueing N79-32892
A contribution to diffusion theory with applications N79-32893
Numerical methods and approximation and modelling problems in stochastic control theory
[AD-A070038] N79-32898
A class of finite element methods for advection-diffusion problems with small diffusion
[CTH-79.01-R] N79-32929

DIGITAL DATA
Spectral characteristics of convolutionally coded digital signals
[NASA-CR-162295] N79-32412
Digital recording using hologram arrays: Optical design for an experimental 100 Mbit/s recorder
[BBC-RD-1979/14] N79-32523

DIGITAL FILTERS
Block implementation of digital filters N79-32462

DIGITAL SIMULATION
Combined discrete network: Continuous control modeling of man-machine systems
[AD-A071574] N79-32842
Dynamic multilevel simulation N79-32872
Simulation of high dimensional systems N79-32958

DIGITAL SYSTEMS
A multichannel digital sound recorder
[BBC-RD-1979/15] N79-32524
Experience with installation and operation of digital electronic balances --- conferences
[LA-UR-79-1029] N79-32530
Some further developments of the iterative digital cellular multiplier
[NPL-DES-51] N79-32860

DIGITAL TECHNIQUES
The design of an error detection and correction system for use with single track airborne digital magnetic recording systems
[RAE-TM-IT-171] N79-32534

DIGITAL TO ANALOG CONVERTERS
High speed, glitch-free digital to analog converter
[NASA-CASE-GSC-12319-1] N79-32852

DIHYDRIDES
Stability of the lanthanide hydrides
[LA-7602-MS] N79-32991

DIMENSIONAL ANALYSIS
A self-avoiding random walk --- on the integer lattice for three or more dimensions N79-32962

DISCRETE ADDRESS BEACON SYSTEM
Interim results of DABS/ATCRBS electromagnetic compatibility testing
[AD-A072087] N79-32418

DISCRETE FUNCTIONS
Discrete-time spectral estimation of continuous-time processes: The orthogonal series method spectral estimation by orthogonal series
[AD-A070641] N79-32952

DISKS
Generalized disks of contractivity for explicit and implicit Runge-Kutta methods
[NASA-CR-162125] N79-32940

DISPLACEMENT
Kinetics of the displacement reaction between Fe and Cu2O at temperatures between 800 and 1050 degrees C
[AD-A070664] N79-32308
Micellar/polymer floods for enhanced oil recovery: A review of displacement mechanisms and their simulation
[ANL/ES-74] N79-32620
DISPLAY DEVICES
Cockpit displays of traffic information: Airline pilots opinions about content, symbology, and format
[NASA-TM-78601] N79-32185
Flight test results of a virtual image, pantograph mounted, control and display station
[AD-A070290] N79-32207
Nematic liquid crystals for display systems
[BMFT-FB-T-78-41] N79-32535
Computer display set AN/UYQ-21 TECHEVAL test. System meets all specifications and is judged to be suitable for OPEVAL
[AD-A070260] N79-32857
Design of IRSS projectors
[AD-A070898] N79-33020
DISTANCE MEASURING EQUIPMENT
Navaid calibration evaluation with a computer controlled avionics data acquisition system
[NLR-MP-78030-U] N79-32193
DISTILLATION
Sugar crops as a source of fuels. Volume 2: Processing and conversion research
[TID-29400-2] N79-32389
DISTRIBUTION [PROPERTY]
Two-photon correlations in amplified laser light
N79-32537
On the structures of HII regions and their distribution in the galaxy
N79-33131
DISTRIBUTION FUNCTIONS
Asymptotic distributions of slope of greatest convex minorant estimators
[AD-A070205] N79-32921
DISTURBING FUNCTIONS
Survey of modern control and observation theory for disturbed, target following aerospace systems. Part 2: Stochastic performance and spacecraft application
[NLR-TR-78082-U-PT-2] N79-32261
DIVIDING [MATHEMATICS]
A proposal for the use of new parallel multiplication and division algorithms, modeled after Egyptian and Babylonian prototypes
[CTH-MATH-1979-5] N79-32933
DOCUMENTATION
Record keeping on aircraft instruments
[PB-295698/5] N79-32208
DOMAIN WALL
Horizontal Bloch line motion in magnetic bubble materials
N79-33068
DOMESTIC ENERGY
Reexamination of the estimation of undiscovered oil resources in the US
[DOE/EIA-0103/31] N79-32618
The use of the heat pumps to raise temperatures in an economical and ecological way --- domestic heating via industrial waste energy
[BMFT-FB-T-78-35] N79-32732
DOPED CRYSTALS
Reverse annealing in radiation-damaged, silicon solar cells
N79-32660
Effect of dopants on annealing performance of silicon solar cells
N79-32661
High-energy electron-induced damage production at room temperature in aluminum-doped silicon
N79-32662
Exploratory development on silicon material for LADIR --- growth of gallium-doped silicon crystals
[AD-A070740] N79-33017
Silicon-germanium alloys for infrared detectors
[AD-A070932] N79-33018
Radiative transitions induced in GaAs by modest heat treatment
[AD-A071039] N79-33088
New materials properties achievable by ion implantation doping and laser processing --- for crystal regrowth by ion scattering
[CONF-781121-22] N79-33093
DOPPLER EFFECT
Trials of the Doppler microwave landing system at Manchester International Airport, October/November 1977
[RAE-TR-78144] N79-32195
DOPPLER NAVIGATION
The effects of the troposphere on Doppler-navigated station positions
[AD-A070184] N79-32188
DOPPLER RADAR
Trials of the Doppler microwave landing system at London [Gatwick] Airport, August 1977
[RAE-TR-78124] N79-32194
DOSIMETERS
Standard procedure for use of thermoluminescence dosimetry in radiation-hardness testing of electronic devices
[AD-A071172] N79-32474
Review of unfolding methods used in the US and their standardization for dosimetry
[BNWL-SA-6503] N79-32828
DRILLING
A mathematical analysis of the rotary piercing process
N79-32548
DROPS [LIQUIDS]
Laminar condensation phenomenon associated with a moving droplet
N79-32495
DRUMS [CONTAINERS]
A survey of packaging for solidified low-level radioactive waste --- studying containers for underground storage
[PB-295038/4] N79-33011
DRY HEAT
The future of hot dry rock geothermal energy systems
[LA-UR-79-683] N79-32679
Federal hot dry rock geothermal energy development program: An overview
[LA-UR-79-670] N79-32690
DTL INTEGRATED CIRCUITS
New functionally integrated circuits
[BMFT-FB-T-78-37] N79-32485
DUMPING
Report to the Congress on ocean dumping research. Public law 92-532, title 2, section 201
[NOAA-S/T-77-2838] N79-32741
DUOPLASMATRONS
Tests on a 50tera neutron generator
[BMVG-FBWT-78-14] N79-33006
DYE LASERS
Energy and technology review --- tunable laser system for the ultraviolet, visible, and infrared regions
[UCRL-52000-79-3] N79-32727
DYES
Binding of anionic dyes to cation-specific poly [crown ethers]
N79-32356
Inelastic electronic collision in hydrocarbons and dyes
[AD-A070172] N79-32986
DYNAMIC CHARACTERISTICS
Mass drivers. 2: Structural dynamics
N79-32231
Static and dynamic finite deformations of viscoelastic solids and structures
N79-32567
Heliostat beam characterization system
[SAND-79-0697C] N79-32703
DYNAMIC LOADS
Random harmonic analysis program, L221 [TEV156]. Volume 2: Supplemental system design and maintenenace document
[NASA-CR-2858] N79-32162
Some investigations on the notching procedure used in shaker tests on satellites
[NLR-TR-76134-U] N79-32255
DYNAMIC MODELS
Earth Radiation Budget Science, 1978 --- conferences
[NASA-CP 2100] N79-32797
Climate modeling --- for use in understanding earth's radiation budget
N79-32799
Car driving as a cybernetic task
[IZF-1979-6] N79-32838
DYNAMIC PROGRAMMING
Dynamic reassignment in distributed processing systems
N79-32888
DYNAMIC RESPONSE
Dynamic response of a rotating, balanced, flexible shaft supported by a thermodynamic bearing system
N79-32549
Measurement system for large motions --- response of geologic media to stress waves from underground nuclear tests
[EGG-1183-1634] N79-32777
The response of germanium to large amplitude shock waves
[AD-A070454] N79-33079
DYNAMIC STRUCTURAL ANALYSIS
Mass drivers. 2: Structural dynamics
N79-32231
Dynamic response of a rotating, balanced, flexible shaft supported by a thermodynamic bearing system
N79-32549
Dynamic analysis of cylindrical shells with cutouts and cracks
N79-32572
The dynamic analysis of structures: A comparison between two different versions of STRUDL 2
N79-32599
Stress concentration factors in spheres with radial flush nozzles
[CRIF-MT-129] N79-32601

E

EARPHONES
A damped flat-plate coupler for use in calibrating circumaural earphones
[NPL-AC-90] N79-32452
EARTH [PLANET]
The effect of solar output, infrared cooling and latitudinal heat transport on the evolution of the earth's climate
[AERONOMICA-ACTA-A-200-1979]
N79-32794
Studies of noble gases in meteorites and in the earth
N79-33135
EARTH CRUST
Deep crustal electrical conductivity in the Adirondacks
N79-32758
EARTH MOVEMENTS
Measurement system for large motions --- response of geologic media to stress waves from underground nuclear tests
[EGG-1183-1634] N79-32777
EARTH RESOURCES
US Geological Survey sources of photographs and images of biosphere reserves taken from spacecraft and aircraft: Everglades National Park
[PB-296353/6] N79-32624
EARTH SURFACE
Recent measurements of the rates of ozone removal from the atmosphere by land surfaces --- agricultural land
[CONF-780636-11] N79-32748
EARTHQUAKES
Seismological studies using observed and synthetic waveforms --- included are wave amplitudes from earthquakes and nuclear explosions
N79-32757
Swedish earthquakes and acceleration probabilities
[FOA-C-20295-E4] N79-32782
ECHO SUPPRESSORS
Evaluation of echo suppression in video teleconferencing via the communications technology satellite
[PB-294965/9] N79-32455
ECONOMETRICS
Demonstration of the capabilities of the Livermore energy policy model
[UCRL-52508] N79-32695
ECONOMIC ANALYSIS
Role of refined product imports in the domestic fuel market
[DOE/EIA-0102/53] N79-32372
Prestressed concrete pressure vessels: Conceptual design/economic, executive summary
[FE-1775-19] N79-32591
Heat pump/rock bed storage systems --- computer program for economic analysis
[COO-4704-2] N79-32705
ECONOMIC FACTORS
Decentralized solar energy technology assessment program: Research plan
[ORNL/TM-6913] N79-32677
Fossil energy program summary document
[DOE/ET-0087] N79-32696
ECONOMIC IMPACT
Economic and demographic issues related to deployment of the Satellite Power System [SPS]
[NASA-CR-158886] N79-32699
Impacts of the Resource Conservation and Recovery Act on the siting of coal-conversion energy facilities in the United States
[ORNL/OEPA-12] N79-32724
ECOSYSTEMS
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
[E79-10271] N79-32605
EDDY CURRENTS
Multifrequency eddy current inspection for cracks under fasteners, phase 2
[AD-A071102] N79-32560
Eddy current testing and ultrasonic reference standards for depleted uranium barstock
[AD-A070295] N79-32971
EDDY VISCOSITY
Large eddy simulation of turbulent channel flow: ILLIAC 4 calculation
[NASA-TM-78619] N79-32152
EDGES
Computational structures for extracting edge features from digital images for real-time control applications
N79-32894
EGYPT
A proposal for the use of new parallel multiplication and division algorithms, modeled after Egyptian and Babylonian prototypes
[CTH-MATH-1979-5] N79-32933
EIGENVALUES
Analytic approaches to unstable resonators --- calculating the eigenvalues and eigenmodes of large Fresnel number resonators using asymptotic approaches
[AD-A071024] N79-32473

Collocation approximation to eigenvalues of an ordinary differential equation: The principle of the thing
[AD-A070197] N79-32913
The construction of Jacobi and periodic Jacobi matrices with prescribed spectra
[AD-A070214] N79-32951
EIGENVECTORS
Analytic approaches to unstable resonators --- calculating the eigenvalues and eigenmodes of large Fresnel number resonators using asymptotic approaches
[AD-A071024] N79-32473
ELASTIC BUCKLING
A finite element model to study the buckling behavior of general orthotropic, midplane symmetric, elastic plates
[NLR-TR-77062-U] N79-32594
ELASTIC DEFORMATION
A high-order theory of laminated plate deformation
N79-32274
Discontinuous deformation gradients in plane finite elastostatics of incompressible materials. 1: General considerations. 2: An example
N79-32571
ELASTIC PLATES
Sixth order analyses of closure in a cracked-elastic-plastic plate
[AD-A070466] N79-32586
ELASTIC PROPERTIES
Discontinuous deformation gradients in plane finite elastostatics of incompressible materials. 1: General considerations. 2: An example
N79-32571
The solution of the axisymmetric elastic-plastic torsion of a shaft using variational inequalities
[AD-A070207] N79-32583
Apex singularities for corner cracks under opening, sliding, and tearing modes
[AD-A070200] N79-32587
ELASTOHYDRODYNAMICS
Comparison of predicted and measured elastohydrodynamic film thickness in a 20-millimeter-bore ball bearing
[NASA-TP-1542] N79-32552
ELASTOMERS
Structure-property relations of elastomeric ABA triblock copolymers
N79-32355
ELASTOSTATICS
Discontinuous deformation gradients in plane finite elastostatics of incompressible materials. 1: General considerations. 2: An example
N79-32571
ELECTRETS
Piezo and pyroelectric properties of electrets --- made from polymer films
[AD-A070808] N79-32475
ELECTRIC ARCS
Dielectric stimulated arcs in lightning arrestor connectors
[SAND-79-0396C] N79-32480
Damage of metal surfaces by a hot dense deuterium plasma --- using unipolar arcing for the study of fusion reactor materials
[COO-4393-03] N79-33057
ELECTRIC BRIDGES
Square function analysis of the inductor-converter bridge
[ANL/FPP/TM-118] N79-32482
ELECTRIC CONTACTS
Intercell ohmic contacts for high efficiency multijunction solar converters
N79-32673
ELECTRIC DISCHARGES
Investigation of the liquid-layer-on-solid sample spark technique
N79-32298
Microscopic investigation of electrostatic discharge phenomena on nonconductive optical solar reflectors with a conductive adhesive
[ESA-STM-211] N79-32729
Plasma sheath processes
[AD-A070819] N79-33044
ELECTRIC ENERGY STORAGE
Newly discovered failure mode in high energy density, energy storage capacitors
[LA-7376-MS] N79-32728
ELECTRIC EQUIPMENT
Energy conservation opportunities in appliances using energy storage
[ORNL/SUB-7303/1] N79-32629
ELECTRIC FIELDS
On the electrically stimulated filtration of aerosols --- the effects of fiber shape on charged particles
N79-32300
Electric fields in the outer magnetosphere: Recent progress and outstanding problems
[TRITA-EPP-79-03] N79-32783
Methods for studying and criteria for evaluating the biological effects of electric fields of industrial frequency
[CONF-780541-1] N79-32827
Analytical treatment of runaway effects --- plasma devices
[IPF-77-4] N79-33061
Pseudopotential methods in the calculation of electronic properties and quadrupole interactions in metals
N79-33074
ELECTRIC GENERATORS
The 150 KVA samarium cobalt USCF starter generator electrical system
[AD-A070078] N79-32468
A preliminary assessment of small steam Rankine and Brayton point-focusing solar modules
[NASA-CR-162302] N79-32632
Assessment of hydropower restoration and expansion in New York State, volume I
[PB-295782/7] N79-32734
HUD utilities demonstration series. Volume 9: Description of the data acquisition and instrumentation systems, Jersey City total energy project --- for energy use and energy plant operations on a building complex
[PB-294926/1] N79-32738
ELECTRIC MOTORS
The 150 KVA samarium cobalt USCF starter generator electrical system
[AD-A070078] N79-32468
ELECTRIC POTENTIAL
Open-circuit voltage improvements in low-resistivity solar cells
N79-32649
ELECTRIC POWER PLANTS
Dynamic modeling, simulation and control of ocean thermal energy conversion power plants
N79-32627
Available work in geothermal energy
[COO-4051-25] N79-32685
Geothermal power plants of the Soviet Union. A technical survey of existing and planned installations
[COO-4051-41] N79-32686
Development of a prototype 10kW solar power plant
[BMFT-FB-T-78-33] N79-32730
Engineering study of the flue gas desulfurization unit for the power plant Weiher 3
[BMFT-FB-T-78-28] N79-32751
ELECTRIC POWER TRANSMISSION
A theoretical investigation of power and control configurations for a high g-onset centrifuge drive system
[AD-A070912] N79-32841
ELECTRIC PULSES
Linear sweep differential pulse voltammetry: Theory and application --- technique and a theoretical equation for combining pulse nature and sweep nature of square waves
N79-32525
ELECTRIC SPARKS
Techniques for observation and control of high voltage spark discharge
N79-32460
ELECTRICAL ENGINEERING
Mass drivers. 1: Electrical design
N79-32230
ELECTRICAL MEASUREMENT
The ampere, the kilogram, and the fundamental constants. Is there a weighing problem?
[NPL-QU-52] N79-32399
HUD utilities demonstration series. Volume 9: Description of the data acquisition and instrumentation systems, Jersey City total energy project --- for energy use and energy plant operations on a building complex
[PB-294926/1] N79-32738
ELECTRICAL PROPERTIES
Characterization of solar cells for space applications. Volume 9: Electrical characteristics of Spectrolab BSF, textured, 10-ohm-cm 200-micron cells as a function of intensity, temperature, and irradiation
[NASA-CR-162289] N79-32631
Electron irradiation of tandem junction solar cells
N79-32657
Pseudopotential methods in the calculation of electronic properties and quadrupole interactions in metals
N79-33074
Electrical properties of thin GaAs films deposited by sputtering
[AD-A070017] N79-33081
ELECTRICAL RESISTIVITY
Effects of interface conductivity on electric logging in western gas sands: A literature review
[BETC/IC-79/2] N79-32621
Deep crustal electrical conductivity in the Adirondacks
N79-32758
ELECTRO-OPTICS
Nematic liquid crystals for display systems
[BMFT-FB-T-78-41] N79-32535
Advanced optical ceramics, phase I
[AD-A070909] N79-33019
Low cost fiber optic cable assemblies for local distribution systems
[AD-A070723] N79-33022
Devices for fiber optics communication
[AD-A070746] N79-33023
ELECTROACOUSTIC TRANSDUCERS
Further results on an array design to measure the wavenumber-frequency spectrum beneath an axisymmetric turbulent boundary layer
[AD-A071048] N79-32505
ELECTROCHEMICAL OXIDATION
Studies in electrochemistry. 1: Microprocessor controlled electrochemistry. 2: Thiamine electrochemical oxidation reactions
N79-32301
ELECTROCHEMISTRY
Semiconducting properties of passive films on tin in slightly alkaline solutions
N79-32294
Studies in electrochemistry. 1: Microprocessor controlled electrochemistry. 2: Thiamine electrochemical oxidation reactions
N79-32301
ELECTRODE FILM BARRIERS
Dielectric stimulated arcs in lightning arrestor connectors
[SAND-79-0396C] N79-32480
ELECTRODES
Electroanalytical applications of reticulated vitreous carbon electrodes
N79-32296
ELECTRODIALYSIS
For today: Membrane-produced gasahol. For tomorrow: Membrane-produced alcohol
[PB-295814/8] N79-32395
ELECTROLUMINESCENCE
Light emitting diodes. A comparative 10,000 hour service test of light emitting diodes, including 26 variants from 15 manufacturers
[ECR-85] N79-32566
ELECTROMAGNETIC ABSORPTION
Aeronomy sounding rocket program. Results of the guard ring probe experiment flown on the payload B1 of the National Aeronomy Winter Anomaly and Trace Constituents program at El Arenosillo, Spain, between December 1975 and January 1976
[BMFT-FB-W-78-26] N79-32253
ELECTROMAGNETIC COMPATIBILITY
Interim results of DABS/ATCRBS electromagnetic compatibility testing
[AD-A072087] N79-32418
ELECTROMAGNETIC FIELDS
Asymptotic rounds for solutions to a system of damped integrodifferential equations of electromagnetic theory
[AD-A070132] N79-32432
Electromagnetic field and mechanical stress analysis code. Appendix A: Preliminary conceptual design study of the riggatron approach to fusion power
[DOE/TIC-4068-T2-APP-A] N79-32443
Studies on the interactions between electromagnetic fields and plasmas
[AD-A071017] N79-33043
ELECTROMAGNETIC INTERACTIONS
Symmetry breaking in nuclei --- involving isospin and parity
N79-32993
ELECTROMAGNETIC NOISE
An investigation into the noise interference problems at Logan Airport, Boston
[AD-A072057] N79-32417
ELECTROMAGNETIC PULSES
A study of the EMP interaction with aircraft over an imperfect ground plane
[AD-A070388] N79-32420
User's manual for SCWAR: A multiwire shielded cable code for a systems oriented EMP vulnerability assessment program
[AD-A070884] N79-32427
ELECTROMAGNETIC RADIATION
Investigation of penetration of electromagnetic energy through joints in advanced composite structures --- aircraft structures
[AD-A069589] N79-32441
Estimates of maximum electric field strengths in the automobile environment
[PB-294819/8] N79-32453
ELECTROMAGNETIC SCATTERING
Bistatic scattering reflection asymmetry and polarization reversal symmetry
[AD-A071008] N79-32426
Source radiation in the presence of convex bodies
[AD-A070827] N79-32440
ELECTROMAGNETIC SHIELDING
User's manual for SCWAR: A multiwire shielded cable code for a systems oriented EMP vulnerability assessment program
[AD-A070884] N79-32427
Electromagnetic shielding formulas
[TRITA-EPP-79-01] N79-32449
ELECTROMAGNETIC WAVE FILTERS
Metal grid angular filters for sidelobe suppression
[AD-A070111] N79-32424
ELECTROMAGNETIC WAVE TRANSMISSION
Proceedings of the 8th Technical Exchange Conference
[AD-A070009] N79-32806
ELECTROMECHANICAL DEVICES
Development of a large electrically driven flyer system for explosive initiation studies
[LA-UR-78-2279] N79-32377
ELECTRON ACCELERATORS
Radioisotope production with electron accelerators
[REPT-78/5] N79-33007

The 500 MeV, 10% d.f. linear accelerator [MEA] under construction at Amsterdam
[REPT-79/1] N79-33008
ELECTRON ATTACHMENT
Investigation of electron attachment in polyatomic molecules --- sulfur hexafluoride, molybdenum hexafluoride, and tungsten oxide vapor
[AD-A070069] N79-32985
ELECTRON BEAM WELDING
Weldability of formable sheet titanium alloy Ti-15V-3Cr-3Al-3Sn
[AD-A070747] N79-32332
On the welding of martensitic hardened steels
[BMVG-FBWT-78-17] N79-32556
ELECTRON BEAMS
Axially-dependent equilibrium of an unneutralized electron beam in an axial magnetic field
[AD-A070592] N79-33040
Effects of hot electrons on magnetohydrodynamic modes in EBT
[ORNL/TM-6824] N79-33054
ELECTRON CAPTURE
Multistage depressed collector for dual mode operation --- for travelling wave tubes
[NASA-CASE-LEW-13282-1] N79-32463
Single electron capture into AR[+] excited states in Ar2 [+] Na collision below 12 keV. 1: Absolute measurement of emission cross-section
[IPPJ-410] N79-33034
ELECTRON CYCLOTRON HEATING
Electron-cyclotron heating of toroidal plasma with emphasis on results from the ELMO Bumpy Torus [EBT]
[ORNL/TM-6703] N79-33052
ELECTRON DENSITY PROFILES
D region amplitude distribution, cone angle of arrival, and electron density profiles
[AD-A070358] N79-32771
Study of the inhomogeneous electron gas at surfaces --- for investigation many body problems and density profiles at surfaces
N79-33069
ELECTRON EMISSION
Diagnosis of the jet plasma using electron cyclotron emission
[NPL-DES-53] N79-33062
ELECTRON ENERGY
The von Weizsaecker and exchange corrections in the Thomas Fermi theory
N79-32981
ELECTRON FLUX DENSITY
Temperature and intensity dependence of the performance of an electron-irradiated [AlGa]As/GaAs solar cell
N79-32665
ELECTRON GAS
Study of the inhomogeneous electron gas at surfaces --- for investigation many body problems and density profiles at surfaces
N79-33069
ELECTRON IRRADIATION
Electron irradiation of tandem junction solar cells
N79-32657
High-energy electron-induced damage production at room temperature in aluminum-doped silicon
N79-32662
Radiation damage in GaAs solar cells
N79-32663
Temperature and intensity dependence of the performance of an electron-irradiated [AlGa]As/GaAs solar cell
N79-32665
ELECTRON MICROSCOPES
Scanning electron microscopy of fracture surfaces of carbon composite materials
[NLR-TR-76035-U] N79-32280
ELECTRON MICROSCOPY
Implantation metallurgy
[SAND-78-1089C] N79-32341
ELECTRON SCATTERING
Inelastic electron scattering from Li-7 in the vicinity of the alpha-triton threshold
[AD-A071072] N79-32983
Inelastic electronic collision in hydrocarbons and dyes
[AD-A070172] N79-32986
ELECTRON SPECTROSCOPY
Stark modulation spectroscopy of molecular crystals
N79-33066
ELECTRON STATES
Single electron capture into AR[+] excited states in Ar2 [+] Na collision below 12 keV. 1: Absolute measurement of emission cross-section
[IPPJ-410] N79-33034
ELECTRON TRANSFER
Cross-field electron heat transport due to high frequency electrostatic waves
[IPPJ-405] N79-33029
ELECTRON TRANSITIONS
Optical detection of spectral diffusion of the triplet state zerofield transition energy --- liquid crystals
[AD-A071179] N79-33084
ELECTRONIC EQUIPMENT
Multistage depressed collector for dual mode operation --- for travelling wave tubes
[NASA-CASE-LEW-13282-1] N79-32463
ELECTRONIC MODULES
Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules
[AD-A070052] N79-32472
ELECTRONS
Electrons and kaons in charmed particle decays --- produced in electron-positron annihilation
[LBL-9017] N79-33003
Observations of 1-6 MeV Jovian electrons at 1 AU and a study of their propagation
N79-33137
ELECTROPHORESIS
Laser Doppler electrophoresis and the mobility of colloidal particles
N79-32297
Dielectrophoretic levitation of spheres and shells
[UCRL-13852-2] N79-32479
ELECTROPHOTOMETRY
Neptune: Limb brightening within the 7300 angstrom methane band
[NASA-CR-162319] N79-33122
ELECTROSTATIC CHARGE
Microscopic investigation of electrostatic discharge phenomena on nonconductive optical solar reflectors with a conductive adhesive
[ESA-STM-211] N79-32729
ELECTROSTATIC WAVES
Cross-field electron heat transport due to high frequency electrostatic waves
[IPPJ-405] N79-33029
ELLIPSOIDS
Numerical solution to the inverse problem of the geodetic ellipsoid of revolution
[SER-B-228-MITT-145] N79-32778
ELLIPSOMETERS
NDE method for characterizing anodized Al surfaces
[AD-A070936] N79-32337
EMBRITTLEMENT
The effects of composition and carbide precipitation of temper embrittlement of 2 1/4 Cr-1 Mo steels
N79-32322
A fracture mechanics evaluation of creep induced embrittlement
N79-32570
EMISSION SPECTRA
Investigation of the liquid-layer-on-solid sample spark technique
N79-32298
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
[E79-10271] N79-32605
Spectral lineshape calculation for a stratospheric emission model
[NPL-QU-50] N79-32780
Single electron capture into AR[+] excited states in Ar2 [+] Na collision below 12 keV. 1: Absolute measurement of emission cross-section
[IPPJ-410] N79-33034
ENCLOSURES
A computer method for calculating the radiative interchange factors in a complex enclosure and an extension of the method to the calculation of the incident flux distribution
[CNES-NT-89] N79-32520
ENERGY ABSORPTION FILMS
Performance evaluation of solar films and screens
[AD-A070039] N79-32674
ENERGY BANDS
Pseudopotential methods in the calculation of electronic properties and quadrupole interactions in metals
N79-33074
ENERGY BUDGETS
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model --- Los Angeles, California and St. Louis, Missouri
[E79-10269] N79-32604
Earth Radiation Budget Science, 1978 --- conferences
[NASA-CP-2100] N79-32797
Earth Radiation Budget Science, 1978. 1: Introduction --- to obtain radiation budget measurements by satellite observation
N79-32798
Climate modeling --- for use in understanding earth's radiation budget
N79-32799
Climate diagnostics --- using radiation and meteorological data for diagnosing climatic fluctuations
N79-32800
ENERGY CONSERVATION
Energy conservation opportunities in appliances using energy storage
[ORNL/SUB-7303/1] N79-32629
Performance evaluation of solar films and screens
[AD-A070039] N79-32674
Production of high-energy chemicals using solar energy heat
[ORNL/SUB-7390/1] N79-32707
ENERGY CONSUMPTION
Energy and cost calculations. 1: Optimization of electrochemical processes to achieve minimum product cost and the impact on energy consumption
[ANL/OEPM-78-2] N79-32697
Energy Emergency Management Information System [EEMIS]: Program plan
[DOE/EIA-0135] N79-32723
HUD utilities demonstration series. Volume 9: Description of the data acquisition and instrumentation systems, Jersey City total energy project --- for energy use and energy plant operations on a building complex
[PB-294926/1] N79-32738
ENERGY CONVERSION
Mission analysis for the federal fuels from biomass program. Volume 4: Thermochemical conversion of biomass to fuels and chemicals
[SAN-0115-T3] N79-32384
Advanced synfuel production with fusion
[BNL-26130] N79-32388
ENERGY CONVERSION EFFICIENCY
Results of the 1978 NASA/JPL balloon flight solar cell calibration program
[NASA-CR-162298] N79-32635
Solar Cell High Efficiency and Radiation Damage, 1979
[NASA-CP-2097] N79-32640
The NASA Lewis Research Center program in space solar cell research and technology --- efficient silicon solar cell development program
N79-32641
Solar photovoltaic research and development program of the Air Force Aero Propulsion Laboratory --- silicon solar cell applicable to satellite power systems
N79-32642
The JPL space photovoltaic program --- energy efficient sol silicon solar cells for space applications
N79-32643
Langley program of GaAs solar cells --- emphasizing energy conversion efficiency and radiation resistance
N79-32644
Updating the limit efficiency of silicon solar cells
N79-32645
Limiting process in shallow junction solar cells
N79-32646
Design of high efficiency HLE solar cells for space and terrestrial applications
N79-32647
Applications of ion implantation to high performance, radiation tolerant silicon solar cells
N79-32648
Open-circuit voltage improvements in low-resistivity solar cells
N79-32649
Modeling of thin, back-wall silicon solar cells
N79-32650
Design considerations for the Tandem Junction Solar Cell
N79-32651
Thin cells for space
N79-32652
High efficiency cell geometry
N79-32653
Efficiency of tandem solar cell systems as function of temperature and solar energy concentration ratio
N79-32671
Performance testing of the Del concentrating solar collector
[SAND-79-0515] N79-32681
ENERGY DISSIPATION
Energy losses in a flat transposed cable --- superconducting cable
[LA-7635-MS] N79-32481
The dissipation of cosmic magnetic fields
N79-33128
ENERGY LEVELS
Pseudopotential methods in the calculation of electronic properties and quadrupole interactions in metals
N79-33074
ENERGY POLICY
Role of refined product imports in the domestic fuel market
[DOE/EIA-0102/53] N79-32372
Recent developments in coal liquefaction in the United States --- conferences
[CONF-790213-5] N79-32383
Mission analysis for the federal fuels from biomass program. Volume 4: Thermochemical conversion of biomass to fuels and chemicals
[SAN-0115-T3] N79-32384
Research and development work for hydrogasification of coal with nuclear processing heat done in the framework of the prototype nuclear processing heater project
[BMFT-FB-T-78-25] N79-32393
Strategic petroleum reserve
[DOE/TIC-10107] N79-32617
Comparison of alternate fuels for aircraft --- liquid hydrogen, liquid methane, and synthetic aviation kerosene
[NASA-TM-80155] N79-32637

Decentralized solar energy technology assessment program: Research plan
[ORNL/TM-6913] N79-32677
The future of hot dry rock geothermal energy systems
[LA-UR-79-683] N79-32679
Evaluation of a large nonconvective solar pond
[MLM-2606(OP)] N79-32680
Stratified thermal storage in residential Solar energy applications
[COO-4523-1] N79-32682
Solar Heating And Cooling Of Buildings [SHACOB]: Requirements definition and impact analysis
[EPRI-ER-808-SY] N79-32687
Federal hot dry rock geothermal energy development program: An overview
[LA-UR-79-670] N79-32690
Systems analysis of solar thermal power systems. Report on task 1: Determination and characterization of solar thermal conversion options
[PNL-2693] N79-32692
Thermal energy storage for advanced solar central receiver power systems
[SAND-78-8221] N79-32694
Demonstration of the capabilities of the Livermore energy policy model
[UCRL-52508] N79-32695
Fossil energy program summary document
[DOE/ET-0087] N79-32696
Potential prediction needs in support of energy systems --- solar-terrestrial interactions
[LA-UR-79-673] N79-32698
Economic and demographic issues related to deployment of the Satellite Power System [SPS]
[NASA-CR-158886] N79-32699
Field tests of photovoltaic power systems
[COO-4094-32] N79-32700
Microprocessor-controlled autonomous sun-following mount for solar photovoltaic energy planning
[COO-4094-34] N79-32702
Experimental performance study of a series solar heat pump
[BNL-25928] N79-32704
Status review of the technology assessment of solar energy program
[LA-UR-79-1369] N79-32714
Application and system design study for cost-effective solar photovoltaic systems at Federal installations
[HCP/M2522-01] N79-32715
Systems framework for energy analysis in developing countries
[BNL-25933] N79-32722
Development of a prototype 10kW solar power plant
[BMFT-FB-T-78-33] N79-32730
Investigations on the aeroelastic stability of large wind turbines
[NPL-MP-78014-U] N79-32731
The use of the heat pumps to raise temperatures in an economical and ecological way --- domestic heating via industrial waste energy
[BMFT-FB-T-78-35] N79-32732
Assessment of hydropower restoration and expansion in New York State, volume 1
[PB-295782/7] N79-32734

ENERGY REQUIREMENTS
Assessment of potential US petroleum supply shortfalls, 1978 - 1980
[DOE/EIA-0102/13] N79-32619

ENERGY SPECTRA
Investigation of the anomalous component of low energy cosmic rays: Experimental results and a numerical model
[MPI-PAE/EXTRATERR-147] N79-33148

ENERGY STORAGE
Energy conservation opportunities in appliances using energy storage
[ORNL/SUB-7303/1] N79-32629
Evaluation of a large nonconvective solar pond
[MLM-2606(OP)] N79-32680
Corrosion in molten salts used for solar thermal storage applications
[SAND-79-0246C] N79-32683
Thermal energy storage for advanced solar central receiver power systems
[SAND-78-8221] N79-32694
Heat pump/rock bed storage systems --- computer program for economic analysis
[COO-4704-2] N79-32705

ENERGY TECHNOLOGY
Fuels from magma: A potential energy source --- producing hydrogen, carbon monoxide, and methane
[SAND-78-0191] N79-32373
Review of current research on hydrocarbon production by plants
[SERI/TR-33-129] N79-32374
Thermodynamic-economic analysis of the synthane process
[COO-4589-1] N79-32379
Metal hydride technology --- hydrogen bonding with intermetallics
[BNL-26047] N79-32387
Methane recovery from coalbeds project technology test projects evaluation of candidate projects
[DOE/TIC-10128] N79-32390
Peat gasification: An experimental study
[CONF-780611-8] N79-32391
Micellar/polymer floods for enhanced oil recovery: A review of displacement mechanisms and their simulation
[ANL/ES-74] N79-32620
Available work in geothermal energy
[COO-4051-25] N79-32685
Solar thermal test facilities users association
[SERI/PR-13-154] N79-32688
Solar Repowering Workshop
[SERI/TP-35-57] N79-32689
Potential prediction needs in support of energy systems --- solar-terrestrial interactions
[LA-UR-79-673] N79-32698
Field tests of photovoltaic power systems
[COO-4094-32] N79-32700
Wind turbines
[ANL/CES/TE-78-9] N79-32711
Status review of the technology assessment of solar energy program
[LA-UR-79-1369] N79-32714
Potential use of wood and agriculture wastes as steam generator fuel for thermal enhanced oil recovery
[SAN-1038-PO-1] N79-32717
Energy information data base. Serial titles
[TID-4579-R-10-SUPPL-1] N79-32721
Proposed industrial energy data base for technical evaluation of alternative energy systems
[CONF-781244-1] N79-32725
Energy and technology review --- tunable laser system for the ultraviolet, visible, and infrared regions
[UCRL-52000-79-3] N79-32727
Renewable ocean energy sources. Part 2: Working papers: ocean winds, currents, waves, tides and salinity gradients
[PB-295876/7] N79-32735
Energy programs at the Johns Hopkins University Applied Physics Lab. --- geothermal, hydroelectric, and ocean thermal energy
[PB-295439/4] N79-32739
Environmental development plan, fossil fuel utilization program
[DOE/EDP-0046] N79-32746
Water related environmental effects in fuel conversion. 1: Summary volume --- water requirements for synthetic fuel technologies
[FE-2445-1-VOL-1] N79-32747

ENERGY TRANSFER
Description of the 3-dimensional 2-phase simulator SHAFT78 for use in geothermal reservoir studies --- mass and energy balance for two phase flow in porous media
[LBL-8802] N79-32684
An electric current model of the magnetosphere
[TRITA-EPP-79-09] N79-32784
Ocean wave forecasting
[AD-A069469] N79-32819
Shock tube studies of reaction and energy transfer rates between molecules and reactive atoms
N79-32980
The von Weizsaecker and exchange corrections in the Thomas Fermi theory
N79-32981
Internal energy transfer in isolated molecules: Ergodic and nonergodic behavior
[AD-A071021] N79-32984

ENGINE ANALYZERS
Standalone engine simulator [SAES], Engine Dynamics simulator [EDS] Xerox Sigma 5 interface hardware manual
[NASA-CR-161301] N79-32213

ENGINE DESIGN
Lean, premixed, prevaporized fuel combustor conceptual design study
[NASA-CR-159647] N79-32211

ENGINE FAILURE
Handling problems resulting from compressor deterioration --- in single engine jet aircraft
[NLR-MP-78019-U] N79-32214

ENGINE PARTS
Development of spiral-groove self-acting seals for helicopter engines
[NASA-CR-159622] N79-32551

ENGINE STARTERS
The 150 KVA samarium cobalt USCF starter generator electrical system
[AD-A070078] N79-32468

ENGINE TESTS
Standalone engine simulator [SAES], Engine Dynamics simulator [EDS] Xerox Sigma 5 interface hardware manual
[NASA-CR-161301] N79-32213

ENGINEERING DRAWINGS
Light emitting diodes for fiber optic communications
[AD-A071158] N79-33021

ENTROPY
Uncertainties in adaptive maximum entropy frequency estimators
[PB-296131/6] N79-32489

ENVIRONMENT EFFECTS
Water related environmental effects in fuel conversion. 1: Summary volume --- water requirements for synthetic fuel technologies
[FE-2445-1-VOL-1] N79-32747

ENVIRONMENT MODELS
Survey of biomedical and environmental data bases, models, and integrated computer systems at Argonne National Laboratory
[ANL/ES-65] N79-32745
A model for diffuse interstellar clouds: Improvements to the theory of molecular hydrogen photodestruction and to the gas phase chemistry of carbon monoxide
N79-33130
Models of P/Tempel 2
[NASA-CR-162292] N79-33138

ENVIRONMENT POLLUTION
The 16 air and water pollution issues facing the nation: Appendix to report
[CED-78-148C-APP-1] N79-32742

ENVIRONMENT PROTECTION
Survey of biomedical and environmental data bases, models, and integrated computer systems at Argonne National Laboratory
[ANL/ES-65] N79-32745
Environmental development plan, fossil fuel utilization program
[DOE/EDP-0046] N79-32746

ENVIRONMENT SIMULATION
Some evolution and stability trends deduced from energy and water vapor balance models
[AERONOMICA-ACTA-A-201-1979] N79-32795

ENVIRONMENTAL ENGINEERING
The use of the heat pumps to raise temperatures in an economical and ecological way --- domestic heating via industrial waste energy
[BMFT-FB-T-78-35] N79-32732

ENVIRONMENTAL MONITORING
Development of multifunctional sea-floor instrumental systems
[SAND-78-0781C] N79-32820

ENVIRONMENTAL TESTS
Methodology investigation. Moisture and temperature conditions in storage containers in humid environments
[AD-A071134] N79-32561

EPIDEMIOLOGY
A deterministic model in biomathematics. Asymptotic behavior and threshold conditions
[CTH-MATH-1979-8] N79-32935

EPITAXY
Epitaxial growth of semi-insulating GaAs
[AD-A071166] N79-33089

EPOXY RESINS
Flow and failure behavior of fiber-reinforced epoxy matrix polymeric composites
[UCRL-13895] N79-32279
Formation and properties of rubber-modified epoxies
N79-32357
Molecular structure and cohesive properties of polymeric adhesives
[AD-A069517] N79-32365

EQUALIZERS [CIRCUITS]
Modulation-delay equalisation applied to common-frequency h.f. circuits: An assessment of the likely improvement
[BBC-RD-1979/13] N79-32404

EQUATIONS OF MOTION
Horizontal Bloch line motion in magnetic bubble materials
N79-33068

EQUATIONS OF STATE
A high-order theory of laminated plate deformation
N79-32274
Experimental determination of the equation of state of explosives and pyrotechnics used in explosive actuators
[SAND-78-8628] N79-32392

EQUIPMENT SPECIFICATIONS
Computer display set AN/UYQ-21 TECHEVAL test. System meets all specifications and is judged to be suitable for OPEVAL
[AD-A070260] N79-32857

ERGODIC PROCESS
Internal energy transfer in isolated molecules: Ergodic and nonergodic behavior
[AD-A071021] N79-32984

EROSION
Evaluation of candidate metals in a simulated space shuttle main engine environment for application as turbine blade dampers
[NASA-CR-161299] N79-32325
Deformation twinning and its role in the cavitation erosion response of HCP Co single crystals
N79-33078

ERROR ANALYSIS
Error estimates for mixed methods --- for the approximation solution of elliptic boundary value problems
[AD-A070196] N79-32920

ERROR CORRECTING CODES
Locally least-cost error correctors for context-free and contextnsensitive parsers
N79-32871
ERROR CORRECTING DEVICES
The design of an error detection and correction system for use with single track airborne digital magnetic recording systems
[RAE-TM-IT-171] N79-32534
The enlargement of fast avalanche photodiode bandwidths by capacitance compensation
[IPF-77-3] N79-33060
ERROR DETECTION CODES
The design of an error detection and correction system for use with single track airborne digital magnetic recording systems
[RAE-TM-IT-171] N79-32534
Computer performance measurement tools and techniques
N79-32849
ERROR FUNCTIONS
On maximum error and boundary conditions in cubic spline interpolation at equidistant knots
[TRITA-NA-79-02] N79-32938
ESA SATELLITES
European space activities
[SP-1014] N79-32242
ESCAPE SYSTEMS
Recovery systems design guide
[AD-A070251] N79-32170
ESRO 4 SATELLITE
Solar MeV protons recorded during experiment S 99 on board ESRO-4 in 1973
[ESA-STR-203] N79-33144
ETHYL ALCOHOL
Sugar crops as a source of fuels. Volume 2: Processing and conversion research
[TID-29400-2] N79-32389
EUCLIDEAN GEOMETRY
Hubble expansion in a Euclidean framework
[TRITA-EPP-79-07] N79-33133
EUROPEAN SPACE AGENCY
European space activities
[SP-1014] N79-32242
EUROPEAN SPACE PROGRAMS
European space activities
[SP-1014] N79-32242
Space activity in Austria, 1978/79
N79-32249
EVALUATION
The costs and benefits of a mid-continent expansion of Loran-C
[PB-294614/3] N79-32196
Preliminary airworthiness evaluation CH-47C with fiberglass rotor blades with T55-L-712 engines
[AD-A069891] N79-32199
EVAPOTRANSPIRATION
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
[E79-10271] N79-32605
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions --- Rio Grande Valley, Texas
[E79-10280] N79-32606
EVERGLADES [FL]
US Geological Survey sources of photographs and images of biosphere reserves taken from spacecraft and aircraft: Everglades National Park
[PB-296353/6] N79-32624
EVOLUTION [DEVELOPMENT]
Nucleosynthesis in supernovae and the origin of isotopic heterogeneity in the early solar system
N79-33126
EXHAUST GASES
Lean, premixed, prevaporized fuel combustor conceptual design study
[NASA-CR-159647] N79-32211
EXISTENCE THEOREMS
A comparison of the existence theorems of Kantorovich and Moore
[AD-A070203] N79-32908
EXPANSION
Extrapolation of asymptotic expansions by a modified Aitken delta sup 2 formula
[SU-326-P-30-61] N79-32882
EXPERIMENTAL DESIGN
Study on expenditure optimization for satellite and Spacelab experiments
[BMFT-FB-W-78-34] N79-32246
Design and analysis of isentropic compression experiments
[UCRL-81797] N79-33097
The zodiacal light experiment E9 on Helios A and B
[BMFT-FB-W-78-28] N79-33132
EXPLOSIVE DEVICES
Development of a large electrically driven flyer system for explosive initiation studies
[LA-UR-78-2279] N79-32377
EXPLOSIVES
Low detonation velocity: High energy explosives
[UCRL-80458] N79-32376
Experimental determination of the equation of state of explosives and pyrotechnics used in explosive actuators
[SAND-78-8628] N79-32392
EXTERNAL STORES
Space shuttle external tank instrumentation evaluation --- wind tunnel tests
[AD-A070443] N79-32257
EXTINCTION
Atmospheric extinction. 1: Synthetic data
[AD-A071006] N79-32772
EXTRACTION
Extraction processes for the production of aluminum, titanium, iron, magnesium, and oxygen and nonterrestrial sources
N79-32240
EXTRAPOLATION
Extrapolation of asymptotic expansions by a modified Aitken delta sup 2 formula
[SU-326-P-30-61] N79-32882
EXTREMELY HIGH FREQUENCIES
Measurement of the velocity of small projectiles using microwaves
[TUM-LRT-RT-TB-77/01] N79-32444
EXTRUDING
A study of wire coating extrusion
N79-32396

F

F-4 AIRCRAFT
Technology trends and maintenance workload requirements for the A-7, F-4, and F-14 aircraft
[AD-A070036] N79-32153
F-14 AIRCRAFT
Technology trends and maintenance workload requirements for the A-7, F-4, and F-14 aircraft
[AD-A070036] N79-32153
F-16 AIRCRAFT
Application of a structured decision process for proper inclusion of human resources in the design of a power unit support stand
[AD-A069978] N79-32840
The multinational F-16 aircraft program: Its progress and concern
[PB-296999/6] N79-33098
FABRICATION
Laser Techniques in Photovoltaic Research
N79-32655
Shallow-homojunction GaAs solar cells
N79-32666
Capacitance transients in p-type GaAs MOS structures and application to lifetime mapping during solar cell fabrication
N79-32668
FACTORIAL DESIGN
Factor of safety - USAF design practice --- conferences
[AD-A070237] N79-32183
FAILURE
Continuum modeling of damage accumulation and ultimate failure in fiber reinforced laminated composite materials
N79-32270
Selecting aluminum alloys to resist failure by fracture mechanisms
[ALCOA-57-77-24-REV] N79-32323
FAILURE ANALYSIS
Flow and failure behavior of fiber-reinforced epoxy matrix polymeric composites
[UCRL-13895] N79-32279
Survivability of silicon nitride bearing
[AD-A070383] N79-32553
Behavior of composite bolted joints at elevated temperature
[NASA-CR-159137] N79-32574
FAILURE MODES
Scanning electron microscopy of fracture surfaces of carbon composite materials
[NLR-TR-76035-U] N79-32280
Investigation of the length dependency of carbon fibers and the related unidirectional composite strength --- fracture load tests
[NLR-TR-78050-U] N79-32291
Fracture mechanics and ambient temperature sustained load fracture
[NLR-MP-78008-U] N79-32595
Newly discovered failure mode in high energy density, energy storage capacitors
[LA-7376-MS] N79-32728
FAR INFRARED RADIATION
Calculation and construction of wide band far infrared filters [MPE balloon telescope]
[MPI-PAE/EXTRATERR-146] N79-33024
FAST FOURIER TRANSFORMATIONS
The study and identification of residual donor species in high purity semiconductors
[AD-A071059] N79-33087
FATIGUE (MATERIALS)
Collected engineering data sheets, Air Force data sheet program --- airframe materials
[AD-A070665] N79-32201
Environmental fatigue crack propagation in metal/composite laminates --- flight simulation tests
[NLR-TR-77122-U] N79-32288
Low cycle fatigue behavior of Ti-Mn alloys
N79-32321
Engineering application of fracture mechanics to flight simulation
[NLR-MP-78015-U] N79-32596
Gust spectrum fatigue crack propagation in candidate skin materials
[NLR-MP-78022-U] N79-32597
FATIGUE LIFE
Thermorheological effects on fatigue life of fiber composites
N79-32272
Fatigue failure prediction by X-ray double crystal diffractometry
[AD-A070296] N79-32327
Effect of an anti-corrosion penetrant on the fatigue life of various riveted joints during flight simulation tests
[NLR-TR-77103-U] N79-32350
FATIGUE TESTS
Residual strength properties of carbon/epoxy composite materials --- airframe materials
[NLR-TR-77039-U] N79-32281
Environmental fatigue crack propagation in metal/composite laminates
[NLR-MP-78027-U] N79-32283
Residual strength of [0, + or - 45] sub s and [+ or - 45, 0] sub s carbon/epoxy laminates --- fatigue loading tests
[NLR-TR-77115-U] N79-32287
Residual strength of Kevlar-carbon/epoxy hybrid composite materials
[NLR-TR-78008-U] N79-32289
Low cycle fatigue properties of MAR-M-246 Hf in hydrogen --- a cast nickel-base alloy
[NASA-CR-161296] N79-32324
Fatigue testing of titanium 6Al4V
[FFA-TN-HU-1993] N79-32348
The axial loading corrosion fatigue properties of 25mm thick high and low strength X166 plate [DTD 5120 and DTD 5130]
[RAE-TR-78114] N79-32600
FEASIBILITY ANALYSIS
Requirements analysis and feasibility study for the Spacelab user program: Supersensitive optical accelerometer
[BMFT-FB-W-78-18] N79-32245
Simulated neutron tomography for nondestructive assays
[LA-UR-79-938] N79-32565
FEEDBACK CONTROL
Quantitative synthesis of multiple loop feedback systems with large uncertainty
[AD-A070273] N79-32896
FERMENTATION
Sugar crops as a source of fuels. Volume 2: Processing and conversion research
[TID-29400-2] N79-32389
For today: Membrane-produced gasahol. For tomorrow: Membrane-produced alcohol
[PB-295814/8] N79-32395
FERMI SURFACES
The von Weizsaecker and exchange corrections in the Thomas Fermi theory
N79-32981
FERRIMAGNETS
Allowed and forbidden transitions in metallic ferromagnetics and ferrimagnets
N79-33067
FERRITES
Ferrites with anomalous hysteresis loops for communication systems
[BMFT-FB-T-78-54] N79-32488
FERROELECTRICITY
Ferroelectric polarization in polymers
[AD-A070768] N79-32362
FERROMAGNETIC FILMS
Ultrasonic generation in thin films of TbFe2
N79-33073
FERROMAGNETIC MATERIALS
Allowed and forbidden transitions in metallic ferromagnetics and ferrimagnets
N79-33067
FIBER COMPOSITES
The viscoelastic response of composite materials
N79-32268
Continuum modeling of damage accumulation and ultimate failure in fiber reinforced laminated composite materials
N79-32270
Boundary layer effects in composite laminates
N79-32271
Flow and failure behavior of fiber-reinforced epoxy matrix polymeric composites
[UCRL-13895] N79-32279
Residual strength of Kevlar-carbon/epoxy hybrid composite materials
[NLR-TR-78008-U] N79-32289
Boron reinforced composites, volume 2. A bibliography with abstracts
[NTIS/PS-79/0476/6] N79-32292

FIBER OPTICS
Analysis of the molecular stuffing strengthening process for glass fiber optical waveguides
N79-33012
Fiber optics for tactical communications
[AD-A070274] N79-33015
Light emitting diodes for fiber optic communications
[AD-A071158] N79-33021
Low cost fiber optic cable assemblies for local distribution systems
[AD-A070723] N79-33022
Devices for fiber optics communication
[AD-A070746] N79-33023

FIBER ORIENTATION
Nondestructive measurement of fiber direction and fiber amount in carbon fiber reinforced laminates
[FOA-C-20306-F9] N79-32286

FIBER STRENGTH
Investigation of the length dependency of carbon fibers and the related unidirectional composite strength --- fracture load tests
[NLR-TR-78050-U] N79-32291
Analysis of the molecular stuffing strengthening process for glass fiber optical waveguides
N79-33012

FIBERS
On the electrically stimulated filtration of aerosols --- the effects of fiber shape on charged particles
N79-32300

FIELD EFFECT TRANSISTORS
Device model for FETSIM circuit simulation program
[NASA-CR-150321] N79-32465
Dynamic effects of avalanche-generated carriers
[AD-A070258] N79-32471
A study of flicker noise in MOSFETS
[AD-A070313] N79-33080
GaAs/AlGaAs herterojunction gate field effect transistor
[AD-A070081] N79-33082

FILE MAINTENANCE [COMPUTERS]
The automatic revision of storage structures
N79-32844

FILM THICKNESS
Comparison of predicted and measured elastohydrodynamic film thickness in a 20-millimeter-bore ball bearing
[NASA-TP-1542] N79-32552

FILTRATION
On the electrically stimulated filtration of aerosols --- the effects of fiber shape on charged particles
N79-32300

FINITE ELEMENT METHOD
Prediction of aerodynamic forces on a circular cylinder and a thin airfoil in a transonic airstream by the finite element method
[AD-A070663] N79-32171
Electromagnetic field and mechanical stress analysis code. Appendix A: Preliminary conceptual design study of the riggatron approach to fusion power
[DOE/TIC-4068-T2-APP-A] N79-32443
Time-dependent FEM solution of the incompressible Navier-Stokes equations in two and three-dimensions
[UCRL-81323] N79-32517
Frequency analysis of a thick-rim flywheel
[ORNL/TM-5804] N79-32555
A finite element model to study the buckling behavior of general orthotropic, midplane symmetric, elastic plates
[NLR-TR-77062-U] N79-32594
Identification of finite state models of human operators
[AD-A070079] N79-32897
An efficient method for solving stiff transient field problems arising from FEM formulations
[AD-A070085] N79-32914
A class of finite element methods for advection-diffusion problems with small diffusion
[CTH-79.01-R] N79-32929

FINS
Effect of outboard vertical-fin position and orientation on the low-speed aerodynamic performance of highly swept wings --- supersonic cruise aircraft research
[NASA-TM-80142] N79-32158
Aerodynamic heating in the fin interaction region of generalized missile shapes at Mach 6 [modular missile test program] --- wind tunnel tests
[AD-A071573] N79-32173

FIRE CONTROL
Flight test results of a virtual image, pantograph mounted, control and display station
[AD-A070290] N79-32207

FISSIONABLE MATERIALS
Simulated neutron tomography for nondestructive assays
[LA-UR-79-938] N79-32565

FLAME PROPAGATION
Combustion of uniformly sized droplet sprays in a refractory tube
N79-32299

FLAME STABILITY
An investigation of flame stability in a coaxial dump combustor
N79-32209

FLAPS [CONTROL SURFACES]
The transonic oscillating flap
[AD-A070022] N79-32200

FLAT CONDUCTORS
Energy losses in a flat transposed cable --- superconducting cable
[LA-7635-MS] N79-32481

FLAT PLATES
Growth characteristics of a through crack in a plate of finite thickness
N79-32568

FLIGHT CHARACTERISTICS
Magnetosphere sounding rocket program. A substorm phenomena payload. Report on system design, integration, testing, and flight
[BMFT-FB-W-78-35] N79-32247

FLIGHT CONTROL
A program verifier and proof of the correctness of a flight director program
N79-32864
Software reliability determination and prediction
[AD-A069976] N79-32880

FLIGHT SIMULATION
Effect of an anti-corrosion penetrant on the fatigue life of various riveted joints during flight simulation tests
[NLR-TR-77103-U] N79-32350
Engineering application of fracture mechanics to flight simulation
[NLR-MP-78015-U] N79-32596
Pilot performance in simulated aerial refueling as a function of tanker model complexity and visual display field-of-view
[AD-A070231] N79-32832
A theoretical investigation of power and control configurations for a high g-onset centrifuge drive system
[AD-A070912] N79-32841

FLIGHT SIMULATORS
Powered-lift aircraft handling qualities in the presence of naturally-occurring and computer-generated atmospheric disturbances
[AD-A072118] N79-32198

FLIGHT STABILITY TESTS
Qualification tests for helicopters to be used on board ships
[NLR-MP-78032-U] N79-32204

FLIGHT TESTS
Preliminary airworthiness evaluation CH-47C with fiberglass rotor blades with T55-L-712 engines
[AD-A069891] N79-32199
Survey and evaluation of potential real-time interactive flight test facilities for the B-1
[AD-A070343] N79-32222

FLOQUET THEOREM
A deterministic model in biomathematics. Asymptotic behavior and threshold conditions
[CTH-MATH-1979-8] N79-32935

FLORIDA
Streamflow simulation studies of the Hillsbrough Alafia, and Anclote rivers, west central Florida
[PB-295569/8] N79-32626

FLOW CHARACTERISTICS
Magnetogasdynamic phenomena in pulsed MHD flows
[AD-A070590] N79-33042

FLOW DISTRIBUTION
Helicopter flow field analysis
[AD-A069542] N79-32174
Flow in nonrotating passages of radial inflow turbines
[NASA-CR-159679] N79-32212
Isothermal flow distribution in solar collectors and collector manifolds
[ALO-5319-1] N79-32708

FLOW STABILITY
Effect of compressibility, suction, and heat transfer on the nonparallel stability of boundary-layer flows
N79-32494
Linear stability of self-similar flow: 5. Convective instability in bounded uniform self-gravitating spheres
[AD-A070709] N79-32508
The wave structures of the Eady model of baroclinic instability
[NASA-TP-1548] N79-32796

FLOW VELOCITY
Rapid calculation of three-dimensional flows in flush inlets
[AD-A069585] N79-32512

FLUID DYNAMICS
Semidirect methods for discretized nonlinear partial differential equations, with particular applications to fluid dynamics
[AD-A069596] N79-32514
The wave structures of the Eady model of baroclinic instability
[NASA-TP-1548] N79-32796

FLUID FLOW
Computer automation of continuous-flow analyzers for trace constituents in water. Volume 4: Description of program segments. Part 1: TAAIN
[UCRL-52532-VOL-4-PT-1] N79-32310
Linear stability of self-similar flow: 5. Convective instability in bounded uniform self-gravitating spheres
[AD-A070709] N79-32508
Transient flow of non-Newtonian power-law fluids in porous media
[SAN-1265-9] N79-32516
Efficient time-stepping methods for miscible displacement problems with nonlinear boundary conditions
[AD-A070211] N79-32922

FLUID MECHANICS
The application of difference methods in fluid mechanics
[AD-A069544] N79-32511

FLUORINE
Experience with fluorine and its safe use as a propellant
[NASA-CR-162296] N79-32369

FLUOROPOLYMERS
Plasma poling of poly [vinylidene fluoride]: Piezoand pyroelectric response
[AD-A070750] N79-32361
Ferroelectric polarization in polymers
[AD-A070768] N79-32362
Piezo and pyroelectric properties of electrets --- made from polymer films
[AD-A070808] N79-32475
Fabrication of piezoelectric polymer film
[AD-A070822] N79-33090

FLUX [RATE]
Observations of 1-6 MeV Jovian electrons at 1 AU and a study of their propagation
N79-33137

FLUX DENSITY
A computer method for calculating the radiative interchange factors in a complex enclosure and an extension of the method to the calculation of the incident flux distribution
[CNES-NT-89] N79-32520

FLYWHEELS
Frequency analysis of a thick-rim flywheel
[ORNL/TM-5804] N79-32555

FOCUSING
Development of techniques for the design of athermalized optical systems --- for focusing and boresighting using wave theory
[AD-A070257] N79-33016

FOKKER-PLANCK EQUATION
Numerical integration of the orbit-averaged Fokker-Planck equation: The evolution of Plummer's model --- for studying the evolution of star clusters
N79-33117

FORCE DISTRIBUTION
Calculation of subsonic normal force and centre of pressure position of bodies of revolution using a slender body theory: Boundary layer method
[WSRL-0093-TR] N79-32160

FOREIGN TRADE
Role of refined product imports in the domestic fuel market
[DOE/EIA-0102/53] N79-32372

FORESTS
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
Feature selection via entropy minimization: An example using LANDSAT satellite data --- forested shorelines near Lake Massaciuccole between Lucca and Pisa, Italy
[E79-10286] N79-32610

FORGING
Heat treatment studies of aluminum alloy type 7050 forgings. Corroded-specimen fatigue tests and SSC propagation tests
[NLR-TR-77124-U] N79-32351
Development of fluorides for high power laser optics
[NVO-1555-4] N79-32546

FORMAT
Cockpit displays of traffic information: Airline pilots opinions about content, symbology, and format
[NASA-TM-78601] N79-32185

FORMULAS [MATHEMATICS]
Electromagnetic shielding formulas
[TRITA-EPP-79-01] N79-32449
Extrapolation of asymptotic expansions by a modified Aitken delta sup 2 formula
[SU-326-P-30-61] N79-32882

FORMULATIONS
Problem formulation --- governing equations for the behavior of general shell forms
N79-32579

FORWARD SCATTERING
Calculation of forward scattered intensity from particles at optical beam propagation
[FOA-C-30164-E1] N79-33026

FOSSIL FUELS
Fossil energy program summary document
[DOE/ET-0087] N79-32696
Environmental development plan, fossil fuel utilization program
[DOE/EDP-0046] N79-32746
FOURIER TRANSFORMATION
Fourier transform infrared analysis of plasma polymerized 2-vinylpyridine thin films
[SAND-78-0761C] N79-32366
Fourier transform nuclear magnetic resonance spectroscopy applications of chemical interest
N79-32979
FRACTOGRAPHY
Scanning electron microscopy of fracture surfaces of carbon composite materials
[NLR-TR-76035-U] N79-32280
FRACTURE MECHANICS
Three-dimensional laminate plates with through and part-through cracks
N79-32276
Selecting aluminum alloys to resist failure by fracture mechanisms
[ALCOA-57-77-24-REV] N79-32323
Fracture toughness of Widmanstatten colonies of an alpha-beta titanium alloy
[AD-A070745] N79-32331
Quantitative models of hydrogen embrittlement in high strength steel
[NLR-MP-78024-U] N79-32347
A fracture mechanics evaluation of creep induced embrittlement
N79-32570
Fracture along planar slip bands
[AD-A070788] N79-32585
Fracture mechanics and ambient temperature sustained load fracture
[NLR-MP-78008-U] N79-32595
Engineering application of fracture mechanics to flight simulation
[NLR-MP-78015-U] N79-32596
The response of germanium to large amplitude shock waves
[AD-A070454] N79-33079
FRACTURE STRENGTH
Residual strength properties of carbon/epoxy composite materials --- airframe materials
[NLR-TR-77039-U] N79-32281
Residual strength characteristics of composite reinforced stiffened panels --- load tests to failure
[NLR-TR-78025-U] N79-32290
Exploratory study of the dynamic fracture ductility of TRIP and 300M steels
[AD-A069909] N79-32338
Aluminum alloys for advanced structural applications in transport aircraft
[NLR-MP-77023-U] N79-32344
FRACTURES (MATERIALS)
Characteristic damage states in composite laminates
N79-32273
Role of deformation processing on the fatigue behavior of a high strength powder metallurgy aluminum alloy
N79-32318
FREE CONVECTION
Thermal stability of natural convection in slots and flow down an inclined heated plane
N79-32497
FREEZING
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions --- Rio Grande Valley, Texas
[E79-10280] N79-32606
FREQUENCY COMPRESSION DEMODULATORS
Low pass filtering of data recorded on magnetic tape in frequency modulated form
[ARL-MECH-ENG-NOTE-373] N79-32527
FREQUENCY CONTROL
The radio spectrum international allocation and regulation
[AD-A070110] N79-32437
FREQUENCY CONVERTERS
High microwave frequency passive components
[AD-A070348] N79-32469
FREQUENCY MODULATION
Modulation-delay equalisation applied to common-frequency h.f. circuits: An assessment of the likely improvement
[BBC-RD-1979/13] N79-32404
FREQUENCY SHIFT
Initial frequency shift of large amplitude plasma wave. 2: Ion acoustic wave
[IPPJ-409] N79-33033
FRESNEL INTEGRALS
Analytic approaches to unstable resonators --- calculating the eigenvalues and eigenmodes of large Fresnel number resonators using asymptotic approaches
[AD-A071024] N79-32473
FRONTS (METEOROLOGY)
Frontal dynamics of a Gulf Stream ring --- survey of cyclonic rings
N79-32816
FUEL COMBUSTION
Combustion of uniformly sized droplet sprays in a refractory tube
N79-32299
Measured effects of boundary conditions on oxides of nitrogen produced by liquid fuel diffusion flames
N79-32302
Feasibility study of liquid pool burning in reduced gravity
[NASA-CR-159642] N79-32303
Development of combustion data to utilize low-Btu gases as industrial process fuels. Project 8985 special report no. 3, nozzle-mix burner
[FE-2489-31] N79-32380
FUEL FLOW
An investigation of flame stability in a coaxial dump combustor
N79-32209
FUEL INJECTION
Liquid fuel jet injection into a simulated subsonic dump combustor
[AD-A071028] N79-32509
FUEL TANKS
Experimental methods for aircraft design qualifications in an exploding warhead environment
[AD-A070381] N79-32203
Space shuttle external tank instrumentation evaluation --- wind tunnel tests
[AD-A070443] N79-32257
FUEL-AIR RATIO
Lean, premixed, prevaporized fuel combustor conceptual design study
[NASA-CR-159647] N79-32211
FUELS
Mission analysis for the Federal Fuels from biomass program. Volume 1: Summary and conclusions
[SAN-0115-T2] N79-32385
FUNCTIONS (MATHEMATICS)
Extrapolation of asymptotic expansions by a modified Aitken delta sup 2 formula
[SU-326-P-30-61] N79-32882
On the description and development of large clusters of galaxies through the cluster-galaxy correlations
N79-33127

G

GALACTIC CLUSTERS
On the description and development of large clusters of galaxies through the cluster-galaxy correlations
N79-33127
GALACTIC RADIATION
Radio recombination line observations of the ionized gas in the Galactic Center
N79-33125
GALACTIC STRUCTURE
Hubble expansion in a Euclidean framework
[TRITA-EPP-79-07] N79-33133
GALAXIES
On the structures of HII regions and their distribution in the galaxy
N79-33131
GALERKIN METHOD
Use of Galerkin methods in numerical weather prediction
[AD-A070458] N79-32807
Efficient time-stepping methods for miscible displacement problems with nonlinear boundary conditions
[AD-A070211] N79-32922
GALLIUM
Effect of dopants on annealing performance of silicon solar cells
N79-32661
Exploratory development on silicon material for LADIR --- growth of gallium-doped silicon crystals
[AD-A070740] N79-33017
GALLIUM ARSENIDES
Millimeter wave low noise front end
[CD.6500636] N79-32487
Langley program of GaAs solar cells --- emphasizing energy conversion efficiency and radiation resistance
N79-32644
Radiation damage in GaAs solar cells
N79-32663
Fabrication of high efficiency and radiation resistant GaAs solar cells
N79-32664
Shallow-homojunction GaAs solar cells
N79-32666
Radiation effects in GaAs AMOS solar cells
N79-32667
Electrical properties of thin GaAs films deposited by sputtering
[AD-A070017] N79-33081
GaAs/AlGaAs herterojunction gate field effect transistor
[AD-A070081] N79-33082
Study Czochralski liquid-seal crystal growing technique
[AD-A070280] N79-33085
Radiative transitions induced in GaAs by modest heat treatment
[AD-A071039] N79-33088
Epitaxial growth of semi-insulating GaAs
[AD-A071166] N79-33089
GAMMA FUNCTION
On sums of gamma order statistics with application to the distribution of R squared in best subset multiple regression
[AD-A070025] N79-32949
GAS ANALYSIS
Studies of noble gases in meteorites and in the earth
N79-33135
GAS CHROMATOGRAPHY
Nanogram techniques. 2: Microscale preparative gas chromatography
[NRC/CNR-TT-1951] N79-32304
Nanogram techniques. 1: Injection without losses on capillary columns
[NRC/CNR-TT-1950] N79-32305
GAS DYNAMICS
Transonic wing redesign using a generalized fictitious gas method
[AD-A070013] N79-32202
GAS FLOW
Optimum axial flow taper in a countercurrent gas centrifuge
[K/OA-4445] N79-32504
GAS GENERATORS
Research and development work for hydrogasification of coal with nuclear processing heat done in the framework of the prototype nuclear processing heater project
[BMFT-FB-T-78-25] N79-32393
Research and development concerning steam gasification of coal: Report on the concept of a prototype plant using nuclear processing heat
[BMFT-FB-T-78-29] N79-32394
GAS INJECTION
Velocity field of a round jet in a cross flow for various jet injection angles and velocity ratios --- Langley V/STOL tunnel
[NASA-TP-1506] N79-32500
GAS MIXTURES
Lean, premixed, prevaporized fuel combustor conceptual design study
[NASA-CR-159647] N79-32211
A model for diffuse interstellar clouds: Improvements to the theory of molecular hydrogen photodestruction and to the gas phase chemistry of carbon monoxide
N79-33130
GAS POCKETS
Methane recovery from coalbeds project technology test projects evaluation of candidate projects
[DOE/TIC-10128] N79-32390
GAS RECOVERY
Methane recovery from coalbeds project technology test projects evaluation of candidate projects
[DOE/TIC-10128] N79-32390
GAS TUNGSTEN ARC WELDING
Weldability of formable sheet titanium alloy Ti-15V-3Cr-3Al-3Sn
[AD-A070747] N79-32332
GAS TURBINE ENGINES
Lean, premixed, prevaporized fuel combustor conceptual design study
[NASA-CR-159647] N79-32211
GAS TURBINES
Water-cooled turbine blade technology study --- for gas turbines
[PB-295892/4] N79-32215
GAS-METAL INTERACTIONS
The formation of reactive intermediates in rare-gas matrices and a study of the interactions involved in proton rare-gas clusters
N79-32982
GASES
Theory of phase transitions in gases adsorbed on solids
N79-33072
GASIFICATION
Peat gasification: An experimental study
[CONF-780611-8] N79-32391
GASOHOL (FUEL)
For today: Membrane-produced gasahol. For tomorrow: Membrane-produced alcohol
[PB-295814/8] N79-32395
GATES (CIRCUITS)
Silicon-gate CMOS/SOS processing
[NASA-CR-150319] N79-32464
GENERAL AVIATION AIRCRAFT
Avionics cost development for use of Loran-C navigation systems by low performance general-aviation aircraft
[AD-A068268] N79-32206
GEODESIC LINES
Numerical solution to the inverse problem of the geodetic ellipsoid of revolution
[SER-B-228-MITT-145] N79-32778
GEODESY
Studies in gravimetric geodesy
[AD-A064741] N79-32768

A global 1 deg. x 1 deg. anomaly field combining satellite, GEOS-3 altimeter and terrestrial anomaly data
[AD-A0647-0] N79-32769
Geodetic bench marks
[PB-296427/8] N79-32792
GEODETIC SURVEYS
Geodetic bench marks
[PB-296427/8] N79-32792
GEOLOGICAL SURVEYS
Geologic application of thermal-inertia mapping from satellite --- Powder River Basin, Arizona and Wyoming
[E79-10282] N79-32607
Survey of the ground-water geology and hydrology of the Pasco Basin, Washington --- waste disposal potential
[RHO-BWI-C-41] N79-32616
GEOMAGNETISM
An electric current model of the magnetosphere
[TRITA-EPP-79-09] N79-32784
The relationship between ionospheric and field aligned currents in the dayside cusp
[DMI-GEOPHYS-PAPERS-R-53] N79-32785
Thule geophysical observatory: Magnetic results, 1950
[ISBN-87-7478-135-9] N79-32786
Thule geophysical observatory: Magnetic results, 1951-1952
[ISBN-87-7478-136-7] N79-32787
Thule geophysical observations: Magnetic results, 1955-1956
[ISBN-87-7478-137-5] N79-32788
GEOPHYSICAL OBSERVATORIES
Thule geophysical observatory: Magnetic results, 1950
[ISBN-87-7478-135-9] N79-32786
Thule geophysical observatory: Magnetic results, 1951-1952
[ISBN-87-7478-136-7] N79-32787
Thule geophysical observations: Magnetic results, 1955-1956
[ISBN-87-7478-137-5] N79-32788
Rude Skov Geophysical Observatory: Magnetic results, 1977
[ISBN-87-7478-161-8] N79-32789
GEOPHYSICAL SATELLITES
Comparisons between various semi-empirical thermospheric models of the terrestrial atmosphere
[AERONOMICA-ACTA-A-199-1979] N79-32764
GEOPHYSICS
Solar-geophysical data number 415, March 1979. Part 1: Prompt reports, data for February 1979, January 1979
[PB-296275/1] N79-33146
GEOPOTENTIAL
A global 1 deg. x 1 deg. anomaly field combining satellite, GEOS-3 altimeter and terrestrial anomaly data
[AD-A064740] N79-32769
GEOPOTENTIAL HEIGHT
Investigation of the long-wavelength gravity field of the oceans
[AD-A064662] N79-32818
GEORGIA
Georgia from space: An explanation of the NASA LANDSAT 1 satellite image color mosaic of the state of Georgia
[CIRC-787] N79-32613
GEOS 3 SATELLITE
A global 1 deg. x 1 deg. anomaly field combining satellite, GEOS-3 altimeter and terrestrial anomaly data
[AD-A064740] N79-32769
GEOTHERMAL ENERGY CONVERSION
Energy extraction operations: Some preliminary results --- thermal energy from granitic rocks by water injection
[LA-UR-79-679] N79-32678
The future of hot dry rock geothermal energy systems
[LA-UR-79-683] N79-32679
Available work in geothermal energy
[COO-4051-25] N79-32685
Geothermal power plants of the Soviet Union. A technical survey of existing and planned installations
[COO-4051-41] N79-32686
Federal hot dry rock geothermal energy development program: An overview
[LA-UR-79-670] N79-32690
Performance tests of the radial outflow reaction turbine for geothermal applications
[UCID-17902] N79-32693
Energy programs at the Johns Hopkins University Applied Physics Lab. --- geothermal, hydroelectric, and ocean thermal energy
[PB-295439/4] N79-32739
GEOTHERMAL RESOURCES
Fuels from magma: A potential energy source --- producing hydrogen, carbon monoxide, and methane
[SAND-78-0191] N79-32373
The future of hot dry rock geothermal energy systems
[LA-UR-79-683] N79-32679
Description of the 3-dimensional 2-phase simulator SHAFT78 for use in geothermal reservoir studies --- mass and energy balance for two phase flow in porous media
[LBL-8802] N79-32684
Available work in geothermal energy
[COO-4051-25] N79-32685
Federal hot dry rock geothermal energy development program: An overview
[LA-UR-79-670] N79-32690
GERMANIUM
The response of germanium to large amplitude shock waves
[AD-A070454] N79-33079
GERMANIUM ALLOYS
Silicon-germanium alloys for infrared detectors
[AD-A070932] N79-33018
GIMBALS
Low-cost inertial navigation for moderate-g missions
[NASA-TM-78611] N79-32205
GLASS
Effect of 25 cycles of launch pad exposure and simulated mission heating on space shuttle reusable surface insulation coated with reaction cured glass
[NASA-TM-80160] N79-32358
Optical versus transport processes in chalcogenide glasses
[AD-A070927] N79-32360
Investigation of broad-band emitters as potential lasing ions between 0.5 and 1.0 micrometers
[AD-A070971] N79-32543
Evaluation of cellular glasses for solar mirror panel applications
[NASA-CR-162303] N79-32634
GLASS FIBERS
Preliminary airworthiness evaluation CH-47C with fiberglass rotor blades with T55-L-712 engines
[AD-A069891] N79-32199
Extraterrestrial fiberglass production using solar energy --- lunar plants or space manufacturing facilities
N79-32237
Analysis of the molecular stuffing strengthening process for glass fiber optical waveguides
N79-33012
GLOBAL POSITIONING SYSTEM
Navstar-Global Positioning System (GPS) Army User Equipment (AUE) Required Operational Capability (ROC)
[AD-A070139] N79-32189
GNOTOBIOTICS
Microbiological evaluation of the mobile biological isolator system
[NASA-CR-162293] N79-32822
GOAL THEORY
The design and implementation of a goal-directed programming language
N79-32866
GOES SATELLITES
A catalog of low-frequency oscillations of the earth's magnetic field as observed as SMS-2 and GOES-2 during December 1977
[PB-294327/2] N79-32793
GOVERNMENT PROCUREMENT
Application and system design study for cost-effective solar photovoltaic systems at Federal installations
[HCP/M2522-01] N79-32715
GRAMMARS
Definition and use of attribute reevaluation in attributed grammars
N79-32863
GRANITE
Energy extraction operations: Some preliminary results --- thermal energy from granitic rocks by water injection
[LA-UR-79-679] N79-32678
GRANTS
Technical assistance for law-enforcement communications: Grant summary
[NASA-CR-162305] N79-32411
GRANULAR MATERIALS
Planar deformation of granular materials
N79-33075
GRAPH THEORY
Cellular graph automata
N79-32874
Random bipartite graphs: Connectedness, isolated nodes, diameters
[AD-A070100] N79-32917
GRAPHITE
A theoretical and experimental study of the thermal properties of xenon adsorbed on graphite
N79-33071
GRAPHITE-EPOXY COMPOSITE MATERIALS
Thermorheological effects on fatigue life of fiber composites
N79-32272
Three-dimensional strength characterization of thick composite laminates
N79-32275
Residual strength characteristics of composite reinforced stiffened panels --- load tests to failure
[NLR-TR-78025-U] N79-32290
Investigation of penetration of electromagnetic energy through joints in advanced composite structures --- aircraft structures
[AD-A069589] N79-32441
Behavior of composite bolted joints at elevated temperature
[NASA-CR-159137] N79-32574
GRAPHS (CHARTS)
Diameters of random graphs
[AD-A070099] N79-32916
Random bipartite graphs: Connectedness, isolated nodes, diameters
[AD-A070100] N79-32917
GRAVIMETERS
Studies in gravimetric geodesy
[AD-A064741] N79-32768
GRAVIMETRY
Studies in gravimetric geodesy
[AD-A064741] N79-32768
GRAVITATION THEORY
An anti-Mach metric in the Jordan-Brans-Dicke theory of gravitation
N79-32760
Theoretical investigations of experimental gravitation --- outlining applications of resonant sensing systems to gravitational wave astronomy
N79-32761
GRAVITATIONAL FIELDS
An anti-Mach metric in the Jordan-Brans-Dicke theory of gravitation
N79-32760
Theoretical investigations of experimental gravitation --- outlining applications of resonant sensing systems to gravitational wave astronomy
N79-32761
Investigation of the long-wavelength gravity field of the oceans
[AD-A064662] N79-32818
GRAVITATIONAL WAVES
An anti-Mach metric in the Jordan-Brans-Dicke theory of gravitation
N79-32760
Theoretical investigations of experimental gravitation --- outlining applications of resonant sensing systems to gravitational wave astronomy
N79-32761
GRAVITY ANOMALIES
A global 1 deg. x 1 deg. anomaly field combining satellite, GEOS-3 altimeter and terrestrial anomaly data
[AD-A064740] N79-32769
Investigation of the long-wavelength gravity field of the oceans
[AD-A064662] N79-32818
Analysis of small scale lunar gravity anomalies: Implications for crater formation and crustal history
N79-33136
GRAVITY WAVES
Steady capillary-gravity waves on deep water
N79-32759
GREEN FUNCTION
Effect of deep wedge-shaped notches of small flank angle on plastic failure
[OUEL-1282/79] N79-32598
GREENLAND
Thule geophysical observatory: Magnetic results, 1950
[ISBN-87-7478-135-9] N79-32786
Thule geophysical observatory: Magnetic results, 1951-1952
[ISBN-87-7478-136-7] N79-32787
Thule geophysical observations: Magnetic results, 1955-1956
[ISBN-87-7478-137-5] N79-32788
Summaries of weather observatories at weather stations in Greenland from 1966 to 1970
[ISBN-87-7478-156-1] N79-32813
GRINDING (COMMINUTION)
Residual stresses in ground steels
[AD-A070798] N79-32584
GROUND STATE
Automated geometry optimization for ground states of molecules
N79-32977
GROUND STATIONS
Studies in gravimetric geodesy
[AD-A064741] N79-32768
GROUND SUPPORT EQUIPMENT
Microprocessor as an intelligent interface between flight data acquisition equipment and a minicomputer
[NLR-MP-78007-U] N79-32861
GROUND WATER
Survey of the ground-water geology and hydrology of the Pasco Basin, Washington --- waste disposal potential
[RHO-BWI-C-41] N79-32616
GROUP THEORY
Groups with solvable word problems
N79-32868
GROUT
Structural model testing for prestressed concrete pressure vessels: A study of grouted vs nongrouted posttensioned prestressing tendon systems
[ORNL/TM-6478] N79-32592

GUARDS [SHIELDS]
Safety shield for vacuum/pressure chamber viewing port
[NASA-CASE-GSC-12513-1] N79-32217
GULF STREAM
Frontal dynamics of a Gulf Stream ring --- survey of cyclonic rings
N79-32816
GUNFIRE
Tentative evaluation of annoyance caused by noise from gunfire
[IZF-1978-21] N79-32843
GUST LOADS
Aircraft design loads due to non-stationary atmospheric turbulence patches
[NLR-TR-78073-U] N79-32216
Environmental fatigue crack propagation in metal/composite laminates
[NLR-MP-78027-U] N79-32283
Gust spectrum fatigue crack propagation in candidate skin materials
[NLR-MP-78022-U] N79-32597
GYROCOMPASSES
Low-cost inertial navigation for moderate-g missions
[NASA-TM-78611] N79-32205

H

HALL GENERATORS
Magnetized whirls in plasma discharges
[FOA-C-20303-D9] N79-33063
HAMILTONIAN FUNCTIONS
On systems of toda type
[AD-A070216] N79-32923
HANDBOOKS
Telehealth handbook: A guide to telecommunications technology for rural health care
[MTR-7581] N79-32413
HARDNESS TESTS
A new method for the measurement of Rockwell diamond indenters
[NPL-MOM-33] N79-32557
HARDWARE
Standalone engine simulator [SAES], Engine Dynamics simulator [EDS] Xerox Sigma 5 interface hardware manual
[NASA-CR-161301] N79-32213
HARMONIC ANALYSIS
Random harmonic analysis program, L221 [TEV156]. Volume 2: Supplemental system design and maintenenace document
[NASA-CR-2858] N79-32162
HARMONIC EXCITATION
Parametrically excited nonlinear multidegree-of-freedom systems --- the parametric excitation is harmonic
N79-32967
HARTMANN FLOW
Hartmann flows in the MHD generator configuration
[AD-A070080] N79-33036
HEALTH
Telehealth handbook: A guide to telecommunications technology for rural health care
[MTR-7581] N79-32413
HEALTH PHYSICS
Avoiding future health problems related to solar energy [photovoltaic] technology
[BNL-25935] N79-32718
Methods for studying and criteria for evaluating the biological effects of electric fields of industrial frequency
[CONF-780541-1] N79-32827
HEAT BALANCE
Heat balance research with a thin-walled cube in a simulated space environment --- satellite design criteria
[NLR-TR-78080-U] N79-32522
HEAT CAPACITY MAPPING MISSION
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions --- Rio Grande Valley, Texas
[E79-10280] N79-32606
Geologic application of thermal-inertia mapping from satellite --- Powder River Basin, Arizona and Wyoming
[E79-10282] N79-32607
Satellite monitoring of sea surface pollution --- North Sea
[E79-10287] N79-32611
HEAT FLUX
Extension of the heat pulse technique to the minute heat capacities of thin films at low temperatures
N79-32491
Stability of density waves in two-phase flow systems
N79-32496
HEAT PIPES
Ceramic heat pipes for high temperature heat removal
[LA-UR-79-332] N79-32518
Recent advances in thermochemical energy storage and transport
[SAND-78-8505] N79-32720
HEAT PUMPS
Experimental performance study of a series solar heat pump
[BNL-25928] N79-32704
Heat pump/rock bed storage systems --- computer program for economic analysis
[COO-4704-2] N79-32705
The use of the heat pumps to raise temperatures in an economical and ecological way --- domestic heating via industrial waste energy
[BMFT-FB-T-78-35] N79-32732
HEAT STORAGE
Stratified thermal storage in residential Solar energy applications
[COO-4523-1] N79-32682
Thermal energy storage for advanced solar central receiver power systems
[SAND-78-8221] N79-32694
Recent advances in thermochemical energy storage and transport
[SAND-78-8505] N79-32720
HEAT TRANSFER
Heat-transfer measurements on a 5-deg sharp cone using infrared scanning and on-board discrete sensor techniques
[AD-A070363] N79-32169
Space shuttle external tank instrumentation evaluation --- wind tunnel tests
[AD-A070443] N79-32257
Effect of compressibility, suction, and heat transfer on the nonparallel stability of boundary-layer flows
N79-32494
Ceramic heat pipes for high temperature heat removal
[LA-UR-79-332] N79-32518
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model --- Los Angeles, California and St. Louis, Missouri
[E79-10269] N79-32604
Energy extraction operations: Some preliminary results --- thermal energy from granitic rocks by water injection
[LA-UR-79-679] N79-32678
Cross-field electron heat transport due to high frequency electrostatic waves
[IPPJ-405] N79-33029
HEAT TRANSFER COEFFICIENTS
Condensation of refrigerants on vertical fluted tubes
[ORNL/TM-5848] N79-32515
HEAT TRANSMISSION
Passive solar heating for buildings
[LA-UR-78-427] N79-32706
HEAT TREATMENT
Heat treatment studies of aluminum alloy type 7050 forgings. Corroded-specimen fatigue tests and SSC propagation tests
[NLR-TR-77124-U] N79-32351
HELICAL ANTENNAS
Design study of a low profile, high frequency antenna system
[AD-A070091] N79-32436
HELICOPTER CONTROL
Performance and workload analysis of inflight helicopter missions
[NLR-MP-77013-U] N79-32834
HELICOPTER ENGINES
Development of spiral-groove self-acting seals for helicopter engines
[NASA-CR-159622] N79-32551
HELICOPTER PERFORMANCE
Qualification tests for helicopters to be used on board ships
[NLR-MP-78032-U] N79-32204
HELICOPTERS
Helicopter flow field analysis
[AD-A069542] N79-32174
Some nonlinear problems in transonic helicopter acoustics
[AD-A069564] N79-32974
HELIOS A
The zodiacal light experiment E9 on Helios A and B
[BMFT-FB-W-78-28] N79-33132
HELIOS B
The zodiacal light experiment E9 on Helios A and B
[BMFT-FB-W-78-28] N79-33132
HELIOS SATELLITES
Heating of spherical interplanetary particles close to the sun [solar probe HELIOS A and B: Experiment 10 z]
[BMFT-FB-W-78-33] N79-33145
HELIOSTATS
Heliostat beam characterization system
[SAND-79-0697C] N79-32703
HERMITIAN POLYNOMIAL
Unitary block diagonalization and the characteristic polynomial of a pencil generated by Hermitian matrices
N79-32902
HETEROGENEITY
Nucleosynthesis in supernovae and the origin of isotopic heterogeneity in the early solar system
N79-33126
HETEROJUNCTION DEVICES
GaAs/AlGaAs herterojunction gate field effect transistor
[AD-A070081] N79-33082
HIGH CURRENT
High current pulsed linear ion accelerators for inertial fusion applications
[SAND-78-0778C] N79-33056
HIGH ENERGY INTERACTIONS
Rules and procedures for the design and operation of hazardous research equipment
[PUB-3001] N79-32397
Modular calorimeter system for use in high energy physics
[COO-3071-239] N79-32994
Electrons and kaons in charmed particle decays --- produced in electron-positron annihilation
[LBL-9017] N79-33003
Ion beam production in the plasma focus device
[UCRL-81962] N79-33053
HIGH PRESSURE
Low detonation velocity: High energy explosives
[UCRL-80458] N79-32376
HIGH SPEED
High speed, glitch-free digital to analog converter
[NASA-CASE-GSC-12319-1] N79-32852
HIGH STRENGTH ALLOYS
Role of deformation processing on the fatigue behavior of a high strength powder metallurgy aluminum alloy
N79-32318
HIGH STRENGTH STEELS
Machining powder metallurgy materials
[AD-A070913] N79-32336
Exploratory study of the dynamic fracture ductility of TRIP and 300M steels
[AD-A069909] N79-32338
Acoustic emission behavior of a low alloy steel --- pressure vessels
[AD-A069965] N79-32339
Quantitative models of hydrogen induced cracking in high strength steel
[NLR-MP-78018-U] N79-32346
Quantitative models of hydrogen embrittlement in high strength steel
[NLR-MP-78024-U] N79-32347
Torsion tests on steels used in the manufacture of high pressure vessels
[NPL-CHEM-97] N79-32349
HIGH TEMPERATURE
Performance of ceramic materials in high temperature steam and hydrogen
[BNL-25812] N79-32367
Behavior of composite bolted joints at elevated temperature
[NASA-CR-159137] N79-32574
HIGH TEMPERATURE TESTS
Elevated-temperature application of the IITRI compression test fixture for graphite/polyimide filamentary composites
[NASA-TP-1496] N79-32277
HIGH VOLTAGES
Techniques for observation and control of high voltage spark discharge
N79-32460
Optically isolated logarithmic nanoammeter capable of floating to 5 kilovolts
[NASA-TP-1527] N79-32467
Radiation damage in high-voltage silicon solar cells
N79-32658
HILBERT SPACE
Semiclosed operators in Hilbert space
N79-32964
HISTOGRAMS
A fast routine for computing
[NASA-TM-78133] N79-32612
HISTORIES
Time history solution program, L225 [TEV126]. Volume 1: Engineering and usage
[NASA-CR-2859] N79-32161
HMX
Deflagration to detonation transition behavior of aluminized HMX
[AD-A070645] N79-32371
HOLOGRAMMETRY
Digital recording using hologram arrays: Optical design for an experimental 100 Mbit/s recorder
[BBC-RD-1979/14] N79-32523
Study of volume phase hologram recording in Fe:LiNbO3 using optical pulses, part 1. Investigation of absorption and gain of laser dyes with picosecond pumping, part 2
N79-32536
HOMOGENEITY
A study of homogeneous reduction of carbon monoxide to hydrocarbons and methanol
N79-32368

HONEYCOMB STRUCTURES
Thermal conductance measurement of honeycomb sandwich panels with carbon fiber reinforced plastic face sheets
[NLR-TR-78081-U] N79-32285
HOT ELECTRONS
Effects of hot electrons on magnetohydrodynamic modes in EBT
[ORNL/TM-6824] N79-33054
HUBBLE CONSTANT
Hubble expansion in a Euclidean framework
[TRITA-EPP-79-07] N79-33133
HUMAN BEHAVIOR
Car driving as a cybernetic task
[IZF-1979-6] N79-32838
Algebraic systems: Applications in the behavioral and social sciences
[AD-A070103] N79-32966
HUMAN CENTRIFUGES
A theoretical investigation of power and control configurations for a high g-onset centrifuge drive system
[AD-A070912] N79-32841
HUMAN FACTORS ENGINEERING
Cockpit displays of traffic information: Airline pilots opinions about content, symbology, and format
[NASA-TM-78601] N79-32185
Prediction of the recognition of real objects as a function of photometric and geometric characteristics
[AD-A071118] N79-32614
Human performance in time-shared verbal and tracking tasks
[AD-A070275] N79-32831
The use of artificial signals during SONAR-watch
[IZF-1978-25] N79-32837
Application of a structured decision process for proper inclusion of human resources in the design of a power unit support stand
[AD-A069978] N79-32840
HUMAN PERFORMANCE
Human performance in time-shared verbal and tracking tasks
[AD-A070275] N79-32831
HUMAN REACTIONS
Effects of amphetamine on response selection and response execution processes in choice reaction tasks
[IZF-1978-8] N79-32839
HUMAN TOLERANCES
Laboratory study of annoyance to combined airplane and road-traffic noise
[NASA-TP-1478] N79-32743
Tentative evaluation of annoyance caused by noise from gunfire
[IZF-1978-21] N79-32843
HYBRID NAVIGATION SYSTEMS
Optimal terrain-aided navigation systems
[SAND-78-0874C] N79-32190
Low-cost inertial navigation for moderate-g missions
[NASA-TM-78611] N79-32205
HYDRIDES
Passivation of the pyrotechnic fuels titanium and titanium hydride in oxidative environments
[SAND-78-0264C] N79-32378
HYDROCARBON COMBUSTION
Early formation of nitrogen oxides during combustion of hydrocarbons
[ONERA-NT-1978-4] N79-32314
Influence of turbulence on hydrocarbon combustion in a stirred combustor
[ONERA-NT-1978-7] N79-32315
HYDROCARBON FUEL PRODUCTION
A study of homogeneous reduction of carbon monoxide to hydrocarbons and methanol
N79-32368
Review of current research on hydrocarbon production by plants
[SERI/TR-33-129] N79-32374
Sugar crops as a source of fuels. Volume 2: Processing and conversion research
[TID-29400-2] N79-32389
HYDROCARBON FUELS
Development of combustion data to utilize low-Btu gases as industrial process fuels. Project 8985 special report no. 3, nozzle-mix burner
[PE-2489-31] N79-32380
HYDROCARBONS
Inelastic electronic collision in hydrocarbons and dyes
[AD-A070172] N79-32986
HYDRODYNAMICS
Column chromatography of polymer latexes
N79-32352
HYDROELECTRIC POWER STATIONS
Assessment of hydropower restoration and expansion in New York State, volume I
[PB-295782/7] N79-32734
Energy programs at the Johns Hopkins University Applied Physics Lab. --- geothermal, hydroelectric, and ocean thermal energy
[PB-295439/4] N79-32739
HYDROGEN
Low cycle fatigue properties of MAR-M-246 Hf in hydrogen --- a cast nickel-base alloy
[NASA-CR-161296] N79-32324
Performance of ceramic materials in high temperature steam and hydrogen
[BNL-25812] N79-32367
A model for diffuse interstellar clouds: Improvements to the theory of molecular hydrogen photodestruction and to the gas phase chemistry of carbon monoxide
N79-33130
On the structures of HII regions and their distribution in the galaxy
N79-33131
HYDROGEN BONDS
Metal hydride technology --- hydrogen bonding with intermetallics
[BNL-26047] N79-32387
HYDROGEN EMBRITTLEMENT
Hydrogen permeation in iron at low temperatures
[AD-A070309] N79-32328
Quantitative models of hydrogen induced cracking in high strength steel
[NLR-MP-78018-U] N79-32346
Quantitative models of hydrogen embrittlement in high strength steel
[NLR-MP-78024-U] N79-32347
HYDROGEN PLASMA
An ion source plasma starting from a cold LaB6 cathode I
[IPPJ-406] N79-33031
On the scaling of magnetic plasma confinement under classical conditions
[TRITA-PFU-79-05] N79-33064
HYDROGEN PRODUCTION
Fuels from magma: A potential energy source --- producing hydrogen, carbon monoxide, and methane
[SAND-78-0191] N79-32373
Advanced synfuel production with fusion
[BNL-26130] N79-32388
HYDROGEN SULFIDE
Photoemission studies of H2S, H2, and S adsorbed on Ru[110]: Evidence for an adsorbed SH species
[AD-A070054] N79-32307
HYDROLOGY
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
Survey of the ground-water geology and hydrology of the Pasco Basin, Washington --- waste disposal potential
[RHO-BWI-C-41] N79-32616
Streamflow simulation studies of the Hillsbrough Alafia, and Anclote rivers, west central Florida
[PB-295569/8] N79-32626
HYDROLYSIS
Kinetics and reaction products of aerobic pyrrhotite [FeS] hydrolysis at ambient temperatures
[METC/RI-79/3] N79-32311
HYDROSTATIC PRESSURE
Inplane and out of plane buckling of thick rings subjected to hydrostatic pressure
N79-32573
HYPERBOLIC FUNCTIONS
Development of random choice numerical methods for blast wave problems
[AD-A071156] N79-32439
HYPERGEOMETRIC FUNCTIONS
A new proof of a Muentz-type theorem of Korevarr and Dixon
[CTH-MATH-1979-7] N79-32934
HYPEROXIA
Mechanisms of oxygen toxicity at the cellular level
[AD-A070026] N79-32823
HYPERSONIC SPEED
A correlation of artificially induced boundary-layer transition data from blunt slender cones at hypersonic speeds
[AD-A070446] N79-32165
HYPERTHERMIA
Hypothermia. A bibliography with abstracts
[NTIS/PS-79/0533/4] N79-32830
HYPERVELOCITY PROJECTILES
Measurement of the velocity of small projectiles using microwaves
[TUM-LRT-RT-TB-77/01] N79-32444
HYPOXIA
Oxygen delivery in the hypoxic perfused heart: Relation to functional and metabolic changes
N79-32825
HYSTERESIS
Ferrites with anomalous hysteresis loops for communication systems
[BMFT-FB-T-78-54] N79-32488

I

ICE
Limiting mechanisms of dislocation motion in ice
N79-32602
IDAHO
Early screening of nuclear waste retrieval and processing alternatives
[LA-UR-78-2412] N79-32998
ILLUMINANCE
Characterization of solar cells for space applications. Volume 8: Electrical characteristics of Spectrolab BSF, BSR, textured 290-micron solar cells [K7] as a function of intensity, temperature and irradiation
[NASA-CR-162290] N79-32630
IMAGE CONTRAST
Noise in coherent optical systems: Minimum detectable object contrast and speckle smoothing
[AD-A070040] N79-33014
IMAGE CONVERTERS
Wide bandwidth liquid crystal light valve --- interface for coherent optical data processing
[AD-A070675] N79-33083
IMAGE INTENSIFIERS
Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules
[AD-A070052] N79-32472
IMAGE PROCESSING
Feature selection via entropy minimization: An example using LANDSAT satellite data --- forested shorelines near Lake Massaciuccole between Lucca and Pisa, Italy
[E79-10286] N79-32610
A fast routine for computing
[NASA-TM-78133] N79-32612
Electronic processing of infrared scanner signals using CCD memory techniques
[NLR-MP-78031-U] N79-32623
A microprocessor based image storage and analysis facility for infrared signature measurement and image processing
[AD-A070288] N79-32858
Computational structures for extracting edge features from digital images for real-time control applications
N79-32894
Real-time nonlinear optical information processing -- using image transducers
[AD-A071541] N79-32899
IMAGE RESOLUTION
Image restoration by short space spectral subtraction
[AD-A070382] N79-33013
IMAGE TRANSDUCERS
Real-time nonlinear optical information processing -- using image transducers
[AD-A071541] N79-32899
IMAGERY
Segmentation of static and dynamic scenes
N79-32870
Noise in coherent optical systems: Minimum detectable object contrast and speckle smoothing
[AD-A070040] N79-33014
Design of IRSS projectors
[AD-A070898] N79-33020
IMAGES
A comparison of verbal and visual imagery learning stategies: Their importance for instrumental technology
[AD-A069983] N79-32833
IMAGING TECHNIQUES
Segmentation of static and dynamic scenes
N79-32870
An analysis of the effects of optical aberrations on relative positions of stars in the image plane of astrometric telescopes
N79-33116
IMPACT PREDICTION
Seismic determination of impact times of supersonic projectiles
[SAND-78-1077] N79-32775
IMPACT TESTING MACHINES
A new method for the measurement of Rockwell diamond indenters
[NPL-MOM-33] N79-32557
IMPLOSIONS
Compression of toroidal plasma by imploding plasma-liner
[IPPJ-408] N79-33032
Optimization of stabilized imploding liner fusion reactors
[AD-A070889] N79-33046
IMPURITIES
The study and identification of residual donor species in high purity semiconductors
[AD-A071059] N79-33087
INCIDENT RADIATION
A computer method for calculating the radiative interchange factors in a complex enclosure and an extension of the method to the calculation of the incident flux distribution
[CNES-NT-89] N79-32520
INCOHERENT SCATTERING
Temperature, molecular nitrogen concentration and turbulence in the lower thermosphere inferred from incoherent scatter data
[AERONOMICA-ACTA-A-204-1979] N79-32767
INCOMPRESSIBILITY
Discontinuous deformation gradients in plane finite elastostatics of incompressible materials. 1: General considerations. 2: An example
N79-32571

INCOMPRESSIBLE FLOW
Multi-element airfoil design by optimization
[NLR-TR-78135-U] N79-32181
Flow in nonrotating passages of radial inflow turbines
[NASA-CR-159679] N79-32212
ADINC: An implicit Lagrangian hydrodynamics code
[AD-A070361] N79-32503
INDEXES [DOCUMENTATION]
Energy information data base. Serial titles
[TID-4579-R-10-SUPPL-1] N79-32721
User's guide to program MAD: A computer program for the organization and manipulation of magnetic tape directories
[ORNL/TM-6597] N79-33102
INDICATING INSTRUMENTS
Extension of the heat pulse technique to the minute heat capacities of thin films at low temperatures N79-32491
INDIUM ALLOYS
Development of an industrial process for the production of indium oxide layers for the improvement of the K-values of insulating glass panes
[BMFT-FB-T-78-34] N79-32282
INDIUM COMPOUNDS
Microscopic investigation of electrostatic discharge phenomena on nonconductive optical solar reflectors with a conductive adhesive
[ESA-STM-211] N79-32729
INDUCTORS
Square function analysis of the inductor-converter bridge
[ANL/FPP/TM-118] N79-32482
INDUSTRIAL ENERGY
Production of high-energy chemicals using solar energy heat
[ORNL/SUB-7390/1] N79-32707
Proposed industrial energy data base for technical evaluation of alternative energy systems
[CONF-781244-1] N79-32725
INDUSTRIAL PLANTS
Impacts of the Resource Conservation and Recovery Act on the siting of coal-conversion energy facilities in the United States
[ORNL/OEPA-12] N79-32724
Assessment of surface runoff from iron and steel mills
[PB-294981/6] N79-32756
INDUSTRIAL WASTES
Assessment of surface runoff from iron and steel mills
[PB-294981/6] N79-32756
INDUSTRIES
Published patent applications and patents resulting from German government sponsored research and development
[BMFT-FB-T-78-31] N79-33151
INELASTIC COLLISIONS
Inelastic electronic collision in hydrocarbons and dyes
[AD-A070172] N79-32986
INELASTIC SCATTERING
Inelastic electron scattering from Li-7 in the vicinity of the alpha-triton threshold
[AD-A071072] N79-32983
Polarization transfer in inelastic proton scattering --- using polarimeter technique and spin-flip probability N79-32992
Properties of multistep amplitudes in charge-exchange reactions
[UCRL-82665] N79-33002
INEQUALITIES
Random bipartite graphs: Connectedness, isolated nodes, diameters
[AD-A070100] N79-32917
SLINEQ: A code to solve systems of linear equations and inequalities
[SAND-78-1442] N79-32925
INERTIAL FUSION [REACTOR]
Sandia's particle beam fusion program
[SAND-79-0600C] N79-33005
Materials considerations for Inertially-Confined Fusion Reactors [ICFR]
[UCRL-81206] N79-33049
High current pulsed linear ion accelerators for inertial fusion applications
[SAND-78-0778C] N79-33056
INERTIAL NAVIGATION
Optimal terrain-aided navigation systems
[SAND-78-0874C] N79-32190
Low-cost inertial navigation for moderate-g missions
[NASA-TM-78611] N79-32205
INFORMATION FLOW
The NPL implementation of level 2 of the X25 interface
[NPL-DNACS-18/79] N79-32862
INFORMATION MANAGEMENT
A simulation technique for enhancing CODASYL database implementations N79-32850
INFORMATION RETRIEVAL
Query execution in DIRECT
[AD-A070195] N79-32856
Cooperative responses from a portable natural language data base query system N79-32867
An automated thesaurus construction based on a distance measurement between keywords N79-33100
On search performance for conjunctive queries in compressed, fully transposed ordered files
[TRITA-NA-79-08] N79-33104
INFORMATION SYSTEMS
Proposed industrial energy data base for technical evaluation of alternative energy systems
[CONF-781244-1] N79-32725
Cost-benefit analysis of selected environmental and data information service programs
[PB-297189/3] N79-32753
A guide and handbook for using the GE Space/RESD libraries
[DOC-79SDS030] N79-33101
National Periodicals Center concept reconsidered: Alternatives and costs
[PB-296351/0] N79-33105
Journal in scientific communication: The roles of authors, publishers, libraries and readers in a vital system
[PB-296263/7] N79-33108
Planetary data system requirements: Multi-mission radio science requirements for the 1978 to 1988 era
[NASA-CR-162306] N79-33139
INFRARED DETECTORS
Heat-transfer measurements on a 5-deg sharp cone using infrared scanning and on-board discrete sensor techniques
[AD-A070363] N79-32169
A photoconductive detector for the middle infrared
[BMFT-FB-W-78-32] N79-32532
Exploratory development on silicon material for LADIR --- growth of gallium-doped silicon crystals
[AD-A070740] N79-33017
Silicon-germanium alloys for infrared detectors
[AD-A070932] N79-33018
INFRARED FILTERS
Calculation and construction of wide band far infrared filters [MPE balloon telescope]
[MPI-PAE/EXTRATERR-146] N79-33024
INFRARED IMAGERY
Georgia from space: An explanation of the NASA LANDSAT 1 satellite image color mosaic of the state of Georgia
[CIRC-787] N79-32613
Electronic processing of infrared scanner signals using CCD memory techniques
[NLR-MP-78031-U] N79-32623
A microprocessor based image storage and analysis facility for infrared signature measurement and image processing
[AD-A070288] N79-32858
INFRARED LASERS
Investigation of broad-band emitters as potential lasing ions between 0.5 and 1.0 micrometers
[AD-A070971] N79-32543
Energy and technology review --- tunable laser system for the ultraviolet, visible, and infrared regions
[UCRL-52000-79-3] N79-32727
INFRARED RADIATION
Multiple scattering effects on transmission through the atmosphere
[AD-A070471] N79-32419
Spectral measurements of infrared sky radiance
[LBL-8778] N79-32776
The effect of solar output, infrared cooling and latitudinal heat transport on the evolution of the earth's climate
[AERONOMICA-ACTA-A-200-1979] N79-32794
Design of IRSS projectors
[AD-A070898] N79-33020
INFRARED SCANNERS
Electronic processing of infrared scanner signals using CCD memory techniques
[NLR-MP-78031-U] N79-32623
INFRARED SPECTRA
Infrared chemiluminescence studies of ion-molecule reactions in a flowing afterglow
[AD-A070068] N79-32309
The visual and near infrared spectrum of methane and its application to Uranus, Neptune, Triton and Pluto N79-33119
INFRARED SPECTROSCOPY
Fourier transform infrared analysis of plasma polymerized 2-vinylpyridine thin films
[SAND-78-0761C] N79-32366
INFRARED TELESCOPES
Control system designs for the shuttle infrared telescope facility
[NASA-CR-162321] N79-33121
INFRARED WINDOWS
Advanced optical ceramics, phase I
[AD-A070909] N79-33019
INHOMOGENEITY
Guided wave propagation in bounded inhomogeneous media N79-32405
INITIATORS [EXPLOSIVES]
Development of a large electrically driven flyer system for explosive initiation studies
[LA-UR-78-2279] N79-32377
INJECTION
Nanogram techniques. 2: Microscale preparative gas chromatography
[NRC/CNR-TT-1951] N79-32304
Nanogram techniques. 1: Injection without losses on capillary columns
[NRC/CNR-TT-1950] N79-32305
Preliminary experiment of neutral beam injection heating in JIPP T-2 device
[IPPJ-392] N79-33027
INLET FLOW
Flow in nonrotating passages of radial inflow turbines
[NASA-CR-159679] N79-32212
Rapid calculation of three-dimensional flows in flush inlets
[AD-A069585] N79-32512
INORGANIC COMPOUNDS
Lunar building materials: Some considerations on the use of inorganic polymers --- adhesives, coatings, and binders N79-32238
INSPECTION
PEP laser surveying system
[LBL-8412] N79-32545
Multifrequency eddy current inspection for cracks under fasteners, phase 2
[AD-A071102] N79-32560
INSTRUMENT PACKAGES
Space shuttle external tank instrumentation evaluation --- wind tunnel tests
[AD-A070443] N79-32257
Measurement system for large motions --- response of geologic media to stress waves from underground nuclear tests
[EGG-1183-1634] N79-32777
Solar MeV protons recorded during experiment S 99 on board ESRO-4 in 1973
[ESA-STR-203] N79-33144
INSULATION
Epitaxial growth of semi-insulating GaAs
[AD-A071166] N79-33089
INSULATORS
Sputtering of insulators in the electronic stopping region N79-33070
INTEGRAL CALCULUS
Multidimensional quadrature formulas using partial derivates
[AD-A070582] N79-32915
INTEGRAL EQUATIONS
Theory of connectivity: A unified approach to boundary methods --- integral equations and series expansions
[AD-A070198] N79-32909
INTEGRATED CIRCUITS
High microwave frequency passive components
[AD-A070348] N79-32469
LSI process development
[BDX-613-2138-REV] N79-32478
INTERFACE STABILITY
Nonparallel stability of two-dimensional nonuniformly heated boundary-layer flows
[NASA-CR-162309] N79-32499
INTERFACES
Microprocessor as an intelligent interface between flight data acquisition equipment and a minicomputer
[NLR-MP-78007-U] N79-32861
INTERFERENCE LIFT
Windtunnel measurements on the interference between a jet and a wing located outside the jet. Part 1: Text, tables, and figures
[NLR-TR-77009-U] N79-32175
INTERMEDIATE FREQUENCIES
Millimeter wave low noise front end
[CD.6500636] N79-32487
INTERMETALLICS
Experimental studies of valence instabilities
[AD-A070352] N79-32306
Metal hydride technology --- hydrogen bonding with intermetallics
[BNL-26047] N79-32387
INTERNAL COMBUSTION ENGINES
Demonstration of a free piston Stirling engine driven linear alternator system
[COO-2764-002] N79-32713
INTERPLANETARY DUST
Heating of spherical interplanetary particles close to the sun [solar probe HELIOS A and B: Experiment 10 z]
[BMFT-FB-W-78-33] N79-33145
INTERPLANETARY FLIGHT
Proposal for an interplanetary mission to sound the outer regions of the solar corona N79-32248
INTERPLANETARY MAGNETIC FIELDS
The magnetic field structure on the magnetosphere boundary
[PR-440] N79-32781

Observations of 1-6 MeV Jovian electrons at 1 AU and a study of their propagation
N79-33137

INTERPOLATION
Modal interpolation program, L215 [INTERP]. Volume 1: Engineering and usage
[NASA-CR-2847] N79-32164
On maximum error and boundary conditions in cubic spline interpolation at equidistant knots
[TRITA-NA-79-02] N79-32938

INTERSTELLAR MAGNETIC FIELDS
The dissipation of cosmic magnetic fields
N79-33128

INTERSTELLAR RADIATION
Radio recombination line observations of the ionized gas in the Galactic Center
N79-33125

INTERSTITIALS
Correlation between the kinetic and thermodynamic properties of interstitial solid solutions
N79-33077

INTRAMOLECULAR STRUCTURES
Internal energy transfer in isolated molecules: Ergodic and nonergodic behavior
[AD-A071021] N79-32984

INVISCID FLOW
Multi-element airfoil viscous-inviscid interactions
[NASA-CR-159125] N79-32157

ION ACCELERATORS
Sandia's particle beam fusion program
[SAND-79-0600C] N79-33005
High current pulsed linear ion accelerators for inertial fusion applications
[SAND-78-0778C] N79-33056

ION ACOUSTIC WAVES
Initial frequency shift of large amplitude plasma wave. 2: Ion acoustic wave
[IPPJ-409] N79-33033

ION BEAMS
Ion beam production in the plasma focus device
[UCRL-81962] N79-33053

ION CYCLOTRON RADIATION
Low pressure chemical ionization studies using rapid scan ICR spectroscopy
N79-32293

ION DENSITY [CONCENTRATION]
Lower ionosphere ion production density and composition in an auroral absorption event
[UIO-SR-79-01] N79-32791
Stability properties of a field-reversed ion layer in a background plasma
[AD-A070611] N79-33039

ION IMPLANTATION
Implantation metallurgy
[SAND-78-1089C] N79-32341
Applications of ion implantation to high performance, radiation tolerant silicon solar cells
N79-32648
Application of ion channeling to radiation damage studies --- for depth profiling of intrinsic defects in metals
[SAND-79-0497C] N79-32990
New materials properties achievable by ion implantation doping and laser processing --- for crystal regrowth by ion scattering
[CONF-781121-22] N79-33093

ION PRODUCTION RATES
Lower ionosphere ion production density and composition in an auroral absorption event
[UIO-SR-79-01] N79-32791

ION SCATTERING
Application of ion channeling to radiation damage studies --- for depth profiling of intrinsic defects in metals
[SAND-79-0497C] N79-32990
New materials properties achievable by ion implantation doping and laser processing --- for crystal regrowth by ion scattering
[CONF-781121-22] N79-33093

ION SOURCES
An ion source plasma starting from a cold LaB6 cathode I
[IPPJ-406] N79-33031

IONIC MOBILITY
Column chromatography of polymer latexes
N79-32352

IONIC REACTIONS
Infrared chemiluminescence studies of ion-molecule reactions in a flowing afterglow
[AD-A070068] N79-32309

IONIZATION
Low pressure chemical ionization studies using rapid scan ICR spectroscopy
N79-32293
Variational description of the positive column with two-stem ionization
[NASA-CR-162314] N79-33035

IONIZED GASES
Plasma sheath processes
[AD-A070819] N79-33044
Radio recombination line observations of the ionized gas in the Galactic Center
N79-33125

IONIZING RADIATION
Radiation damage in high-voltage silicon solar cells
N79-32658

IONOSPHERE
Auroral data analysis
[AD-A070180] N79-32770

IONOSPHERIC CURRENTS
The relationship between ionospheric and field aligned currents in the dayside cusp
[DMI-GEOPHYS-PAPERS-R-53] N79-32785

IONOSPHERIC ELECTRON DENSITY
An improved ionospheric irregularity model
[AD-A070282] N79-32773

IONOSPHERIC PROPAGATION
Prediction of transionospheric signal time delays at widely separated locations using correlative techniques
[AD-A070538] N79-32187
Aeronomy sounding rocket program. Results of the guard ring probe experiment flown on the payload B1 of the National Aeronomy Winter Anomaly and Trace Constituents program at El Arenosillo, Spain, between December 1975 and January 1976
[BMFT-FB-W-78-26] N79-32253
Predicting transionospheric propagation conditions
[AD-A070283] N79-32421

IONS
Preliminary experiment of neutral beam injection heating in JIPP T-2 device
[IPPJ-392] N79-33027
An ion source plasma starting from a cold LaB6 cathode I
[IPPJ-406] N79-33031
Single electron capture into AR[+] excited states in Ar2 [+] Na collision below 12 keV. 1: Absolute measurement of emission cross-section
[IPPJ-410] N79-33034
Stability properties of a field-reversed ion layer in a background plasma
[AD-A070611] N79-33039

IRON
Kinetics of the displacement reaction between Fe and Cu2O at temperatures between 800 and 1050 degrees C
[AD-A070664] N79-32308
Hydrogen permeation in iron at low temperatures
[AD-A070309] N79-32328
Study of volume phase hologram recording in Fe:LiNbO3 using optical pulses, part 1. Investigation of absorption and gain of laser dyes with picosecond pumping, part 2
N79-32536
Residual stresses in ground steels
[AD-A070798] N79-32584
Ultrasonic generation in thin films of TbFe2
N79-33073

IRON OXIDES
The effect of a magnesium oxide additive on the reduction of iron oxides
[TKK-V-A3(1978)] N79-32343

IRREGULARITIES
An improved ionospheric irregularity model
[AD-A070282] N79-32773

IRREVERSIBLE PROCESSES
Kinetic models for irreversible processes on a lattice
[IS-T-850] N79-33092

IRRIGATION
Overview of waste heat utilization techniques --- spray irrigation, soil heating, aquiculture and biomass production
[CONF-790443-2] N79-32726

ISENTROPIC PROCESSES
Design and analysis of isentropic compression experiments
[UCRL-81797] N79-33097

ISIS SATELLITES
Auroral data analysis
[AD-A070180] N79-32770

ISOMERS
Epimerization of isotactic polystyrene
N79-32354

ISOTHERMAL FLOW
Isothermal flow distribution in solar collectors and collector manifolds
[ALO-5319-1] N79-32708

ITALY
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609
Feature selection via entropy minimization: An example using LANDSAT satellite data --- forested shorelines near Lake Massaciuccole between Lucca and Pisa, Italy
[E79-10286] N79-32610

ITERATIVE NETWORKS
Some further developments of the iterative digital cellular multiplier
[NPL-DES-51] N79-32860

ITERATIVE SOLUTION
Searching for solutions of finite nonlinear systems: An interval approach
N79-32903

J

JACOBI MATRIX METHOD
The construction of Jacobi and periodic Jacobi matrices with prescribed spectra
[AD-A070214] N79-32951

JAMMING
Modelling and system identification for the inphase/quadrature process
N79-32407
Jamming signal reduction in spread spectrum systems
[AD-A069947] N79-32435

JET AIRCRAFT NOISE
Commercial aircraft flight deck noise criteria
[AD-A072029] N79-32969

JET FLOW
An investigation of low Reynolds number free vertical jet flows
N79-32155
Experimental investigation of the aerodynamic characteristics of a wing in a jet flow --- wind tunnel tests
[NLR-TR-77081-U] N79-32177

JET PROPULSION
Aircraft vortex marking program
[NASA-CR-162299] N79-32156

JOINTS [JUNCTIONS]
Investigation of penetration of electromagnetic energy through joints in advanced composite structures --- aircraft structures
[AD-A069589] N79-32441
Behavior of composite bolted joints at elevated temperature
[NASA-CR-159137] N79-32574

JOURNAL BEARINGS
Dynamic response of a rotating, balanced, flexible shaft supported by a thermodynamic bearing system
N79-32549

JUNCTION TRANSISTORS
Technology of interfaces on silicate glass passivated semiconductor power devices
[BMFT-FB-T-78-40] N79-32486
A study of flicker noise in MOSFETS
[AD-A070313] N79-33080

JUPITER [PLANET]
Observations of 1-6 MeV Jovian electrons at 1 AU and a study of their propagation
N79-33137

K

KANSAS
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data
[E79-10283] N79-32608

KAONS
Electrons and kaons in charmed particle decays --- produced in electron-positron annihilation
[LBL-9017] N79-33003

KERNEL FUNCTIONS
Integral kernels and approximation on totally real submanifolds of vector space exponent n
[CTH-MATH-1979-1] N79-32930

KEROSENE
Comparison of alternate fuels for aircraft --- liquid hydrogen, liquid methane, and synthetic aviation kerosene
[NASA-TM-80155] N79-32637

KEVLAR [TRADEMARK]
Residual strength of Kevlar-carbon/epoxy hybrid composite materials
[NLR-TR-78008-U] N79-32289
Kevlar properties investigation development of Kevlar tensile test methods
[AD-A071405] N79-32363

KINEMATICS
Application of various theories to kinematic shimmy studies
[TUM-MW-14-7701] N79-32550

KINETIC EQUATIONS
Analytical treatment of runaway effects --- plasma devices
[IPF-77-4] N79-33061

KINETICS
Correlation between the kinetic and thermodynamic properties of interstitial solid solutions
N79-33077

L

LABORATORIES
Survey of biomedical and environmental data bases, models, and integrated computer systems at Argonne National Laboratory
[ANL/ES-65] N79-32745

LABORATORY EQUIPMENT
Rules and procedures for the design and operation of hazardous research equipment
[PUB-3001] N79-32397

LAKE CHAMPLAIN BASIN [NY-VT]
Limnology of Lake Champlain
[PB-295612/6] N79-32625
LAKES
Feature selection via entropy minimization: An example using LANDSAT satellite data --- forested shorelines near Lake Massaciuccole between Lucca and Pisa, Italy
[E79-10286] N79-32610
LAMINAR BOUNDARY LAYER
Calculation of the flow around a swept wing, taking into account the effect of the three-dimensional boundary layer. Part 2: Wing with laminar boundary layer on the lower surface
[NLR-TR-77066-U] N79-32176
Laminar condensation phenomenon associated with a moving droplet
N79-32495
LAMINAR FLOW
The mass and heat transfer in laminar pulsatile flow
N79-32492
Thermal stability of natural convection in slots and flow down an inclined heated plane
N79-32497
LAMINAR HEAT TRANSFER
The mass and heat transfer in laminar pulsatile flow
N79-32492
LAMINATES
Research Workshop on Mechanics of Composite Materials
N79-32267
Plasticity of composite laminates
N79-32269
Continuum modeling of damage accumulation and ultimate failure in fiber reinforced laminated composite materials
N79-32270
Boundary layer effects in composite laminates
N79-32271
Characteristic damage states in composite laminates
N79-32273
A high-order theory of laminated plate deformation
N79-32274
Three-dimensional strength characterization of thick composite laminates
N79-32275
Three-dimensional laminate plates with through and part-through cracks
N79-32276
Residual strength properties of carbon/epoxy composite materials --- airframe materials
[NLR-TR-77039-U] N79-32281
Environmental fatigue crack propagation in metal/composite laminates
[NLR-MP-78027-U] N79-32283
Thermal conductance measurement of honeycomb sandwich panels with carbon fiber reinforced plastic face sheets
[NLR-TR-78081-U] N79-32285
Nondestructive measurement of fiber direction and fiber amount in carbon fiber reinforced laminates
[FOA-C-20306-F9] N79-32286
Residual strength of {0, + or - 45] sub s and [+ or - 45, 0] sub s carbon/epoxy laminates --- fatigue loading tests
[NLR-TR-77115-U] N79-32287
Environmental fatigue crack propagation in metal/composite laminates --- flight simulation tests
[NLR-TR-77122-U] N79-32288
LANCE MISSILE
The 14818C Lance, missile number 3398, round no. 328 APT
[AD-A070489] N79-32809
LAND USE
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
LANDSAT SATELLITES
US Geological Survey sources of photographs and images of biosphere reserves taken from spacecraft and aircraft: Everglades National Park
[PB-296353/6] N79-32624
LANDSAT 1
Georgia from space: An explanation of the NASA LANDSAT 1 satellite image color mosaic of the state of Georgia
[CIRC-787] N79-32613
LANTHANUM COMPOUNDS
An ion source plasma starting from a cold LaB6 cathode 1
[IPPJ-406] N79-33031
LAP JOINTS
Photoelastic studies of advanced lap joint concept
[NASA-CR-162316] N79-32575
LARGE AREA CROP INVENTORY EXPERIMENT
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data
[E79-10283] N79-32608
LARGE SCALE INTEGRATION
A survey of LSI test methodology
[AD-A070733] N79-32476
LSI process development
[BDX-613-2138-REV] N79-32478
New functionally integrated circuits
[BMFT-FB-T-78-37] N79-32485
LASER ANEMOMETERS
Development of tunable high pressure CO2 laser for lidar measurements of pollutants and wind velocities, January 1976 to December 1977
[NASA-CR-3175] N79-32540
LASER APPLICATIONS
Study of volume phase hologram recording in Fe:LiNbO3 using optical pulses, part 1. Investigation of absorption and gain of laser dyes with picosecond pumping, part 2
N79-32536
Two-photon correlations in amplified laser light
N79-32537
Possible use of two laser beams to determine particle-size distribution
[AD-A070965] N79-32542
Laser Techniques in Photovoltaic Research
N79-32655
Synchronization of clocks in the 100 ps range
[ONERA-NT-1978-1] N79-32968
Research report, 1977 --- laser applications
N79-33059
New materials properties achievable by ion implantation doping and laser processing --- for crystal regrowth by ion scattering
[CONF-781121-22] N79-33093
LASER DAMAGE
Radiation damage of laser materials. A bibliography with abstracts
[NTIS/PS-79/0514/4] N79-32547
LASER DOPPLER VELOCIMETERS
Laser Doppler electrophoresis and the mobility of colloidal particles
N79-32297
An experimental evaluation of a laser velocimeter by the study of turbulence in a plane free jet at high subsonic velocities
[AD-A070102] N79-32502
LASER FUSION
Development of fluorides for high power laser optics
[NVO-1555-4] N79-32546
Microwave experimental simulation of laser plasma interactions
[UCLA-ENG-7931] N79-33051
LASER MATERIALS
Ion bombardment of materials containing alkali metals of alkaline earths
[AD-A070284] N79-32541
Investigation of broad-band emitters as potential lasing ions between 0.5 and 1.0 micrometers
[AD-A070971] N79-32543
Radiation damage of laser materials. A bibliography with abstracts
[NTIS/PS-79/0514/4] N79-32547
LASER PLASMA INTERACTIONS
Brillouin backscatter dependence upon pulse amplitudes, timing, target material and geometry
[AD-A070300] N79-33037
Long-pulse laser-plasma interactions at 10 to the 12th power-10 to the 15th power W/cm squared
[AD-A070462] N79-33047
LASER PUMPING
Study of volume phase hologram recording in Fe:LiNbO3 using optical pulses, part 1. Investigation of absorption and gain of laser dyes with picosecond pumping, part 2
N79-32536
Nuclear-pumped lasers 2
[NASA-CR-162320] N79-32539
LASER TARGETS
Brillouin backscatter dependence upon pulse amplitudes, timing, target material and geometry
[AD-A070300] N79-33037
LASERS
Two-photon correlations in amplified laser light
N79-32537
High power phase locked laser oscillators
[NASA-CR-159630] N79-32538
Inverse bremsstrahlling absorption rate in an intense laser field
[UCRL-13965] N79-32544
PEP laser surveying system
[LBL-8412] N79-32545
Long-pulse laser-plasma interactions at 10 to the 12th power-10 to the 15th power W/cm squared
[AD-A070462] N79-33047
LATEX
Column chromatography of polymer latexes
N79-32352
LATTICE PARAMETERS
On systems of toda type
[AD-A070216] N79-32923
LATTICES [MATHEMATICS]
On systems of toda type
[AD-A070216] N79-32923
A self-avoiding random walk --- on the integer lattice for three or more dimensions
N79-32962
LAUNCH VEHICLES
Data verification tests of a 0.03-scale NASA space shuttle launch vehicle at Mach numbers from 0.60 to 1.55
[AD-A070442] N79-32256
LEARNING
A comparison of verbal and visual imagery learning stategies: Their importance for instrumental technology
[AD-A069983] N79-32833
LEAST SQUARES METHOD
A Monte Carlo comparison of some ridge and other biased estimators
[AD-A069566] N79-32955
LECTURES
Research Workshop on Mechanics of Composite Materials
N79-32267
LENGTH
Investigation of the length dependency of carbon fibers and the related unidirectional composite strength --- fracture load tests
[NLR-TR-78050-U] N79-32291
LEVITATION
Dielectrophoretic levitation of spheres and shells
[UCRL-13852-2] N79-32479
LIBRARIES
Brief instructions for using the Sandia Mathematical Subroutine Library [version 7.2]
[SAND-77-1441] N79-32924
A guide and handbook for using the GE Space/RESD libraries
[DOC-79SDS030] N79-33101
National Periodicals Center concept reconsidered: Alternatives and costs
[PB-296351/0] N79-33105
Journal in scientific communication: The roles of authors, publishers, libraries and readers in a vital system
[PB-296263/7] N79-33108
LIE GROUPS
On systems of toda type
[AD-A070216] N79-32923
LIFE [DURABILITY]
Survivability of silicon nitride bearing
[AD-A070383] N79-32553
Light emitting diodes. A comparative 10,000 hour service test of light emitting diodes, including 26 variants from 15 manufacturers
[ECR-85] N79-32566
LIFE SUPPORT SYSTEMS
Space resources and space settlements
[NASA-SP-428] N79-32225
Systems engineering overview for regenerative life-support systems applicable to space habitats
N79-32226
Research planning criteria for regenerative life-support systems applicable to space habitats
N79-32227
Effect of environmental parameters on habitat structural weight and cost
N79-32228
Habitat and logistic support requirements for the initiation of a space manufacturing enterprise
N79-32229
LIFT
The oblique wing as a lifting-line problem in transonic flow
[AD-A070232] N79-32166
LIGHT (VISIBLE RADIATION)
Energy and technology review --- tunable laser system for the ultraviolet, visible, and infrared regions
[UCRL-52000-79-3] N79-32727
Observations on V1357 Cyg = Cyg X-1. The search for the optical radiation of the accretion disk
[PR-408] N79-33124
LIGHT BEAMS
Calculation of forward scattered intensity from particles at optical beam propagation
[FOA-C-30164-E1] N79-33026
LIGHT EMITTING DIODES
Light emitting diodes. A comparative 10,000 hour service test of light emitting diodes, including 26 variants from 15 manufacturers
[ECR-85] N79-32566
Light emitting diodes for fiber optic communications
[AD-A071158] N79-33021
LIGHT SCATTERING
Possible use of two laser beams to determine particle-size distribution
[AD-A070965] N79-32542
Microwave experimental simulation of laser plasma interactions
[UCLA-ENG-7931] N79-33051
LIGHT TRANSMISSION
Multiple scattering effects on transmission through the atmosphere
[AD-A070471] N79-32419
High power phase locked laser oscillators
[NASA-CR-159630] N79-32538
Proceedings of the 8th Technical Exchange Conference
[AD-A070009] N79-32806

LIGHTNING
An investigation into the noise interference problems at Logan Airport, Boston
(AD-A072057) N79-32417

LIGHTNING SUPPRESSION
Dielectric stimulated arcs in lightning arrestor connectors
(SAND-79-0396C) N79-32480

LIMNOLOGY
Limnology of Lake Champlain
(PB-295612/6) N79-32625

LINE SPECTRA
On the structures of HII regions and their distribution in the galaxy
N79-33131

LINEAR ACCELERATORS
The 500 MeV, 10% d.f. linear accelerator (MEA) under construction at Amsterdam
(REPT-79/1) N79-33008
High current pulsed linear ion accelerators for inertial fusion applications
(SAND-78-0778C) N79-33056

LINEAR ENERGY TRANSFER (LET)
Study of the inhomogeneous electron gas at surfaces --- for investigation many body problems and density profiles at surfaces
N79-33069

LINEAR EQUATIONS
SLINEQ: A code to solve systems of linear equations and inequalities
(SAND-78-1442) N79-32925
The AQ algorithm for the solution of a sparse system of linear equations
(NPL-DNACS-17/79) N79-32928

LINEAR PREDICTION
A Bayesian approach to random coefficient models --- using linear regression models
N79-32944

LINEAR PROGRAMMING
On the complexity of d-dimensional Voronoi diagrams
(AD-A070098) N79-32912
Variational principles for problems with linear constraints. Prescribed jumps and continuation type restrictions
(AD-A070199) N79-32919

LINEAR SYSTEMS
Time history solution program, L225 (TEV126). Volume 1: Engineering and usage
(NASA-CR-2859) N79-32161
Some algorithmic problems in linear systems, I
(AD-A070138) N79-32911
Computations related to G-stability of linear multistep methods
(TRITA-NA-79-11) N79-32942
A Bayesian approach to random coefficient models --- using linear regression models
N79-32944
Comments on a simple proof of the separation theorem for linear stochastic systems with time delays
(AD-A070272) N79-32946

LINEARIZATION
Some stability properties of linear multistep compound discretizations of partitioned differential systems
(TRITA-NA-79-10) N79-32941

LINES OF FORCE
The magnetic field structure on the magnetosphere boundary
(PR-440) N79-32781

LININGS
Optimization of stabilized imploding liner fusion reactors
(AD-A070889) N79-33046

LIQUID CHROMATOGRAPHY
Column chromatography of polymer latexes
N79-32352

LIQUID COOLING
Water-cooled turbine blade technology study --- for gas turbines
(PB-295892/4) N79-32215

LIQUID CRYSTALS
Nematic liquid crystals for display systems
(BMFT-FB-T-78-41) N79-32535
Lateral diffusion in model membranes by pulsed nuclear magnetic resonance --- to investigate molecular dynamics of liquid crystal systems
N79-32978
Wide bandwidth liquid crystal light valve --- interface for coherent optical data processing
(AD-A070675) N79-33083
Optical detection of spectral diffusion of the triplet state zerofield transition energy --- liquid crystals
(AD-A071179) N79-33084

LIQUID HYDROGEN
Evaluation of candidate metals in a simulated space shuttle main engine environment for application as turbine blade dampers
(NASA-CR-161299) N79-32325
Comparison of alternate fuels for aircraft --- liquid hydrogen, liquid methane, and synthetic aviation kerosene
(NASA-TM-80155) N79-32637

LIQUID INJECTION
Generation of a rotating liquid liner by tangential injection
(AD-A070890) N79-33038

LIQUID METALS
Observations of the vacuum arc and metal transfer during vacuum consumable arc remelting --- maraging steel alloys
(SAND-79-0922C) N79-32342

LIQUID ROCKET PROPELLANTS
Aspects of the performance of chemical rocket thrust systems
(TUM-LRT-RT-TB-78/3) N79-32263

LIQUID SURFACES
Measured effects of boundary conditions on oxides of nitrogen produced by liquid fuel diffusion flames
N79-32302
Feasibility study of liquid pool burning in reduced gravity
(NASA-CR-159642) N79-32303

LIQUID-SOLID INTERFACES
Nonparallel stability of two-dimensional nonuniformly heated boundary-layer flows
(NASA-CR-162309) N79-32499

LIQUIDS
Investigation of the liquid-layer-on-solid sample spark technique
N79-32298
The role of structure in determining the thermodynamic properties of homogeneous fluid mixtures --- using radial and probability distribution functions
N79-33094

LITERATURE
A critical review of relevant literature --- relating to stress analysis of pressure vessels
N79-32578
Effects of interface conductivity on electric logging in western gas sands: A literature review
(BETC/IC-79/2) N79-32621

LITHIUM
The formation of reactive intermediates in rare-gas matrices and a study of the interactions involved in proton rare-gas clusters
N79-32982

LITHIUM FLUORIDES
Development of fluorides for high power laser optics
(NVO-1555-4) N79-32546

LITHIUM ISOTOPES
Inelastic electron scattering from Li-7 in the vicinity of the alpha-triton threshold
(AD-A071072) N79-32983

LITHIUM NIOBATES
Study of volume phase hologram recording in Fe:LiNbO3 using optical pulses, part 1. Investigation of absorption and gain of laser dyes with picosecond pumping, part 2
N79-32536

LITHIUM SULFUR BATTERIES
Temperature profile in Li/So2 cells during discharge
(AD-A070378) N79-32676

LOAD TESTS
HiMAT structural development design methodology --- aeroelastic tailoring of the canard and wing box and distributed load tests
(NASA-CR-144886) N79-32197
Effect of an anti-corrosion penetrant on the fatigue life of various riveted joints during flight simulation tests
(NLR-TR-77103-U) N79-32350
Fracture mechanics and ambient temperature sustained load fracture
(NLR-MP-78008-U) N79-32595

LOADING MOMENTS
Thermorheological effects on fatigue life of fiber composites
N79-32272
Characteristic damage states in composite laminates
N79-32273

LOGIC CIRCUITS
A survey of LSI test methodology
(AD-A070733) N79-32476
Dependency networks as a representation for modelling in general problem solvers
N79-32889

LOGIC DESIGN
Standalone engine simulator (SAES), Engine Dynamics simulator (EDS) Xerox Sigma 5 interface hardware manual
(NASA-CR-161301) N79-32213

LOGISTICS MANAGEMENT
Habitat and logistic support requirements for the initiation of a space manufacturing enterprise
N79-32229

LONG TERM EFFECTS
Potential prediction needs in support of energy systems --- solar-terrestrial interactions
(LA-UR-79-673) N79-32698
Urbanization and its effects on the climate of Phoenix
N79-32740
Long term effect on the ozone layer of nitrogen oxides produced by thermonuclear explosions in the atmosphere
(AERONOMICA-ACTA-A-198-1979)
N79-32763

LORAN C
The costs and benefits of a mid-continent expansion of Loran-C
(PB-294614/3) N79-32196
Avionics cost development for use of Loran-C navigation systems by low performance general-aviation aircraft
(AD-A068268) N79-32206

LOW COST
Low-cost inertial navigation for moderate-g missions
(NASA-TM-78611) N79-32205

LOW PASS FILTERS
Low pass filtering of data recorded on magnetic tape in frequency modulated form
(ARL-MECH-ENG-NOTE-373) N79-32527

LOW PRESSURE
Low pressure chemical ionization studies using rapid scan ICR spectroscopy
N79-32293
Manometers for extremely low pressure
(BMFT-FB-T-78-38) N79-32531

LOW SPEED
Effect of outboard vertical-fin position and orientation on the low-speed aerodynamic performance of highly swept wings --- supersonic cruise aircraft research
(NASA-TM-80142) N79-32158
Wind tunnel tests on cambered wings of mild gothic planform. Part 1: Further low speed tests. Part 2: Transonic tests
(ARC-R/M-3827) N79-32179
Estimation of tunnel blockage from wall pressure signatures: A review and data correlation
(NASA-CR-152241) N79-32219
Low detonation velocity: High energy explosives
(UCRL-80458) N79-32376

LOW TEMPERATURE
Extension of the heat pulse technique to the minute heat capacities of thin films at low temperatures
N79-32491

LOWER IONOSPHERE
Lower ionosphere ion production density and composition in an auroral absorption event
(UIO-SR-79-01) N79-32791

LUBRICANT TESTS
Evaluation and auger analysis of a zinc-dialkyldithiophosphate antiwear additive in several diester lubricants
(NASA-TP-1544) N79-32359

LUBRICATION
Comparison of predicted and measured elastohydrodynamic film thickness in a 20-millimeter-bore ball bearing
(NASA-TP-1542) N79-32552

LUMINAIRES
Recognition of the aircraft navigation light colour code
N79-32186

LUMINESCENCE
Noise in coherent optical systems: Minimum detectable object contrast and speckle smoothing
(AD-A070040) N79-33014

LUNAR BASES
The initial lunar supply base
N79-32236
Extraterrestrial fiberglass production using solar energy --- lunar plants or space manufacturing facilities
N79-32237
Lunar building materials: Some considerations on the use of inorganic polymers --- adhesives, coatings, and binders
N79-32238

LUNAR CRATERS
Analysis of small scale lunar gravity anomalies: Implications for crater formation and crustal history
N79-33136

LUNAR CRUST
Analysis of small scale lunar gravity anomalies: Implications for crater formation and crustal history
N79-33136

LUNAR EVOLUTION
Analysis of small scale lunar gravity anomalies: Implications for crater formation and crustal history
N79-33136
Lunar studies
(NASA-CR-162318) N79-33141

LUNAR GEOLOGY
A geologic assessment of potential lunar ores
N79-32239
Extraction processes for the production of aluminum, titanium, iron, magnesium, and oxygen and nonterrestrial sources
N79-32240

LUNAR GRAVITATION
Analysis of small scale lunar gravity anomalies: Implications for crater formation and crustal history
N79-33136

LUNAR LAUNCH
Mass drivers. 3: Engineering
N79-32232

LUNAR ROCKS
Mining and beneficiation of lunar ores
N79-32241

LUNAR SOIL
A geologic assessment of potential lunar ores N79-32239
Lunar studies
[NASA-CR-162318] N79-33141
LUNAR SURFACE
Lunar studies
[NASA-CR-162318] N79-33141

M

MACH INERTIA PRINCIPLE
An anti-Mach metric in the Jordan-Brans-Dicke theory of gravitation N79-32760
MACHINING
Machining powder metallurgy materials
[AD-A070913] N79-32336
Precision machining versus optical process
[UCRL-82528] N79-32398
MAGMA
Fuels from magma: A potential energy source --- producing hydrogen, carbon monoxide, and methane
[SAND-78-0191] N79-32373
MAGNESIUM ALLOYS
Development of supercorroding alloys for use as timed releases for ocean engineering applications
[AD-A070860] N79-32334
MAGNESIUM OXIDES
The effect of a magnesium oxide additive on the reduction of iron oxides
[TKK-V-A3[1978]] N79-32343
MAGNETIC ANOMALIES
Aeronomy sounding rocket program. Results of the guard ring probe experiment flown on the payload B1 of the National Aeronomy Winter Anomaly and Trace Constituents program at El Arenosillo, Spain, between December 1975 and January 1976
[BMFT-FB-W-78-26] N79-32253
MAGNETIC DISKS
Flexible disk file structures for microcomputer systems N79-32851
MAGNETIC DOMAINS
Horizontal Bloch line motion in magnetic bubble materials N79-33068
MAGNETIC FIELD CONFIGURATIONS
The magnetic field structure on the magnetosphere boundary
[PR-440] N79-32781
Simulation of cometary magnetic tails
[PR-439] N79-33143
MAGNETIC FIELDS
Axially-dependent equilibrium of an unneutralized electron beam in an axial magnetic field
[AD-A070592] N79-33040
An MHD instability primer
[AD-A071099] N79-33048
Simulation of cometary magnetic tails
[PR-439] N79-33143
MAGNETIC FLUX
Flux compression generators as plasma compression power sources
[LA-UR-79-1064] N79-33058
Design and analysis of isentropic compression experiments
[UCRL-81797] N79-33097
MAGNETIC MATERIALS
Horizontal Bloch line motion in magnetic bubble materials N79-33068
MAGNETIC MEASUREMENT
Rude Skov Geophysical Observatory: Magnetic results, 1977
[ISBN-87-7478-161-8] N79-32789
A catalog of low-frequency oscillations of the earth's magnetic field as observed as SMS-2 and GOES-2 during December 1977
[PB-294327/2] N79-32793
MAGNETIC MIRRORS
Definition and conceptual design of a small fusion reactor
[EPRI-ER-1045] N79-33004
MAGNETIC RECORDING
Low pass filtering of data recorded on magnetic tape in frequency modulated form
[ARL-MECH-ENG-NOTE-373] N79-32527
The design of an error detection and correction system for use with single track airborne digital magnetic recording systems
[RAE-TM-IT-171] N79-32534
MAGNETIC SIGNATURES
Thule geophysical observatory: Magnetic results, 1950
[ISBN-87-7478-135-9] N79-32786
Thule geophysical observatory: Magnetic results, 1951-1952
[ISBN-87-7478-136-7] N79-32787
Thule geophysical observations: Magnetic results, 1955-1956
[ISBN-87-7478-137-5] N79-32788
MAGNETIC TAPES
PCM techniques aid in storing analog data: An exact magnetic-tape storage method for analog measurement signals
[ORNL/TR-4573] N79-32529
User's guide to program MAD: A computer program for the organization and manipulation of magnetic tape directories
[ORNL/TM-6597] N79-33102
MAGNETOELASTIC WAVES
Ultrasonic generation in thin films of ThFe2 N79-33073
MAGNETOHYDRODYNAMIC FLOW
Magnetogasdynamic phenomena in pulsed MHD flows
[AD-A070590] N79-33042
MAGNETOHYDRODYNAMIC GENERATORS
Hartmann flows in the MHD generator configuration
[AD-A070080] N79-33036
Magnetogasdynamic phenomena in pulsed MHD flows
[AD-A070590] N79-33042
MAGNETOHYDRODYNAMIC STABILITY
Stability properties of a field-reversed ion layer in a background plasma
[AD-A070611] N79-33039
An MHD instability primer
[AD-A071099] N79-33048
Some properties of the reverse-field Z-pinch: An overview
[LA-7798-MS] N79-33050
Effects of hot electrons on magnetohydrodynamic modes in EBT
[ORNL/TM-6824] N79-33054
Analytical treatment of runaway effects --- plasma devices
[IPF-77-4] N79-33061
MAGNETOSONIC RESONANCE
Fast magnetosonic wave spectrum in a transversely magnetized plasma cavity
[TRITA-PFU-79-06] N79-33065
MAGNETOSPHERE
Magnetosphere sounding rocket program. A substorm phenomena payload. Report on system design, integration, testing, and flight
[BMFT-FB-W-78-35] N79-32247
Auroral data analysis
[AD-A070180] N79-32770
The magnetic field structure on the magnetosphere boundary
[PR-440] N79-32781
Electric fields in the outer magnetosphere: Recent progress and outstanding problems
[TRITA-EPP-79-03] N79-32783
An electric current model of the magnetosphere
[TRITA-EPP-79-09] N79-32784
MAGNETOSTATIC FIELDS
Fast magnetosonic wave spectrum in a transversely magnetized plasma cavity
[TRITA-PFU-79-06] N79-33065
MAGNETOSTRICTION
Allowed and forbidden transitions in metallic ferromagnetics and ferrimagnets N79-33067
MAGNETS
The 150 KVA samarium cobalt USCF starter generator electrical system
[AD-A070078] N79-32468
MAINTENANCE
Centralizing Air Force aircraft component repair in the field can provide significant savings
[PB-295320/6] N79-32154
Prevention of early pavement deterioration --- due to moisture in asphalt mixes, temperature susceptability, and transverse cracking
[PB-296337/9] N79-32402
Reliability analysis and optimum maintenance scheduling of molded-case circuit breakers N79-32461
MAJORITY CARRIERS
Dynamic effects of avalanche-generated carriers
[AD-A070258] N79-32471
MAN ENVIRONMENT INTERACTIONS
Shalit Perceptual Organization and Reduction Questionnaire [SPORQ]. Report 2: Characteristics and reliability
[FOA-C-55031-H6] N79-32836
MAN MACHINE SYSTEMS
Human performance in time-shared verbal and tracking tasks
[AD-A070275] N79-32831
Combined discrete network: Continuous control modeling of man-machine systems
[AD-A071574] N79-32842
MANAGEMENT INFORMATION SYSTEMS
Energy Emergency Management Information System [EEMIS]: Program plan
[DOE/EIA-0135] N79-32723
Spatial data management system
[AD-A070243] N79-32853
The integrated computer database as a medium for the management and access of textual information N79-33099
MANAGEMENT METHODS
Management of radioactive fuel wastes: The Canadian disposal program
[AECL-6314] N79-33000
MANAGEMENT PLANNING
Research planning criteria for regenerative life-support systems applicable to space habitats N79-32227
Systems framework for energy analysis in developing countries
[BNL-25933] N79-32722
The multinational F-16 aircraft program: Its progress and concern
[PB-296999/6] N79-33098
Transportation systems management element
[PB-295349/5] N79-33111
Proceedings of the 4th US-German Urban Transportation Workshop
[PB-294972/5] N79-33113
MANEUVERS
Car driving as a cybernetic task
[IZF-1979-6] N79-32838
MANGANESE ALLOYS
Low cycle fatigue behavior of Ti-Mn alloys N79-32321
MANIFOLDS [MATHEMATICS]
Integral kernels and approximation on totally real submanifolds of vector space exponent n
[CTH-MATH-1979-1] N79-32930
MANOMETERS
Manometers for extremely low pressure
[BMFT-FB-T-78-38] N79-32531
A review of the fundamental methods used for measuring gage pressures up to kPa
[NPL-MOM-34] N79-32533
MANUAL CONTROL
A theoretical and experimental analysis of the outside world perception process
[NLR-MP-78020-U] N79-32835
MANUFACTURING
Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules
[AD-A070052] N79-32472
Light emitting diodes for fiber optic communications
[AD-A071158] N79-33021
MANY BODY PROBLEM
Study of the inhomogeneous electron gas at surfaces --- for investigation many body problems and density profiles at surfaces N79-33069
MARAGING STEELS
Observations of the vacuum arc and metal transfer during vacuum consumable arc remelting --- maraging steel alloys
[SAND-79-0922C] N79-32342
MARKET RESEARCH
Role of refined product imports in the domestic fuel market
[DOE/EIA-0102/53] N79-32372
MARKETING
Solar Repowering Workshop
[SERI/TP-35-57] N79-32689
MARS [PLANET]
Nutation of Mars
[NASA-CR-162300] N79-33140
The mapping of Martian soil density. A comparison of albedo, topography, and geology
[PR-417] N79-33142
MARTENSITE
Phase transformations in Ti alloys: A review of recent developments
[AD-A070906] N79-32330
MARTENSITIC STAINLESS STEELS
On the welding of martensitic hardened steels
[BMVG-FBWT-78-17] N79-32556
MASS DRIVERS [PAYLOAD DELIVERY]
Mass drivers. 1: Electrical design N79-32230
Mass drivers. 2: Structural dynamics N79-32231
Mass drivers. 3: Engineering N79-32232
Retrieval of asteroidal materials N79-32234
MASS SPECTROMETERS
Manometers for extremely low pressure
[BMFT-FB-T-78-38] N79-32531
MASS SPECTROSCOPY
Low pressure chemical ionization studies using rapid scan ICR spectroscopy N79-32293
Nanogram techniques. 2: Microscale preparative gas chromatography
[NRC/CNR-TT-1951] N79-32304
Nanogram techniques. 1: Injection without losses on capillary columns
[NRC/CNR-TT-1950] N79-32305
MASS TRANSFER
Observations of the vacuum arc and metal transfer during vacuum consumable arc remelting --- maraging steel alloys
[SAND-79-0922C] N79-32342
The mass and heat transfer in laminar pulsatile flow N79-32492

Laminar condensation phenomenon associated with a moving droplet
N79-32495
Micellar/polymer floods for enhanced oil recovery: A review of displacement mechanisms and their simulation
[ANL/ES-74] N79-32620
Description of the 3-dimensional 2-phase simulator SHAFT78 for use in geothermal reservoir studies --- mass and energy balance for two phase flow in porous media
[LBL-8802] N79-32684

MATERIALS HANDLING
Experience with fluorine and its safe use as a propellant
[NASA-CR-162296] N79-32369

MATERIALS RECOVERY
Round-trip missions to low delta-V asteroids and implications for material retrieval
N79-32233
Fossil energy program summary document
[DOE/ET-0087] N79-32696
Impacts of the Resource Conservation and Recovery Act on the siting of coal-conversion energy facilities in the United States
[ORNL/OEPA-12] N79-32724
Early screening of nuclear waste retrieval and processing alternatives
[LA-UR-78-2412] N79-32998

MATHEMATICAL LOGIC
Algebraic systems: Applications in the behavioral and social sciences
[AD-A070103] N79-32966

MATHEMATICAL MODELS
The transonic oscillating flap
[AD-A070022] N79-32200
Aircraft design loads due to non-stationary atmospheric turbulence patches
[NLR-TR-78073-U] N79-32216
Aerodynamic stability technology for maneuverable missiles. Volume 1: Configuration aerodynamic characteristics
[AD-A070250] N79-32250
Plasticity of composite laminates
N79-32269
Continuum modeling of damage accumulation and ultimate failure in fiber reinforced laminated composite materials
N79-32270
Mathematical modeling and micromechanics of fiber-reinforced bimodulus composite materials
[AD-A071389] N79-32278
Quantitative models of hydrogen embrittlement in high strength steel
[NLR-MP-78024-U] N79-32347
Mathematical model of forward combustion retorting of oil shale
[LETC/TPR-78/1] N79-32375
Modelling and system identification for the inphase/quadrature process
N79-32407
Spectral characteristics of convolutionally coded digital signals
[NASA-CR-162295] N79-32412
A millimeter wave attenuation and depolarization experiment using the COMSTAR and CTS satellites
[NASA-CR-162315] N79-32442
Stability of density waves in two-phase flow systems
N79-32496
Vorticity-stream function formulation of compressible and incompressible turbulent flows
[AD-A070043] N79-32501
Rapid calculation of three-dimensional flows in flush inlets
[AD-A069585] N79-32512
Heat balance research with a thin-walled cube in a simulated space environment --- satellite design criteria
[NLR-TR-78080-U] N79-32522
Dynamic response of a rotating, balanced, flexible shaft supported by a thermodynamic bearing system
N79-32549
The solution of the axisymmetric elastic-plastic torsion of a shaft using variational inequalities
[AD-A070207] N79-32583
Reexamination of the estimation of undiscovered oil resources in the US
[DOE/EIA-0103/31] N79-32618
Dynamic modeling, simulation and control of ocean thermal energy conversion power plants
N79-32627
Modeling of thin, back-wall silicon solar cells
N79-32650
Computer modeling of a two-junction, monolithic cascade solar cell
N79-32672
Solar radiation model validation
[SAND-79-1120C] N79-32712
Meteorological data for solar energy applications
N79-32733
A summation and inhibition model of annoyance response to multiple community noise sources
[NASA-TP-1479] N79-32744
Some problems of validation and testing of numerical air pollution models
[COO-2874-41] N79-32749
River quality models near outfalls
[OUEL-1270/78] N79-32752
VOC [Volatile Organic Compounds] emissions reduction study for oxidant attainment in Massachusetts, Rhode Island, and Connecticut
[PB-294983/2] N79-32754
Aeronomical models of the stratosphere
[AERONOMICA-ACTA-A-202-1979] N79-32765
Radiation modeling --- solar and terrestrial radiation
N79-32801
Modification of NMC analyses and prognoses for use in statistical tropical cyclone prediction models
[PB-297190/1] N79-32814
Estimation of rate constants in the Michaelis-Menten model
[AD-A070360] N79-32824
A theoretical and experimental analysis of the outside world perception process
[NLR-MP-78020-U] N79-32835
Heavy traffic results for single server queues with dependent EARMA service and interarrival times
[AD-A070086] N79-32895
Identification of finite state models of human operators
[AD-A070079] N79-32897
A Bayesian approach to random coefficient models --- using linear regression models
N79-32944
Kinetic models for irreversible processes on a lattice
[IS-T-850] N79-33092
Models of P/Tempel 2
[NASA-CR-162292] N79-33138
Investigation of the anomalous component of low energy cosmic rays: Experimental results and a numerical model
[MPI-PAE/EXTRATERR-147] N79-33148

MATHEMATICAL PROGRAMMING
Time history solution program, L225 [TEV126]. Volume 1: Engineering and usage
[NASA-CR-2859] N79-32161
On numerical analysis in semi-infinite programming
[TRITA-NA-79-07] N79-32887
On the use of spline functions and collocation in a trajectory optimization algorithm based on mathematical programming
[NLR-TR-78016-U] N79-32926
Local and superlinear convergence of a class of variable metric methods
[AD-A070208] N79-32960

MATRICES [MATHEMATICS]
Unitary block diagonalization and the characteristic polynomial of a pencil generated by Hermitian matrices
N79-32902
Note on the practical significance of the Drazin inverse
[NASA-CR-162307] N79-32907
Diameters of random graphs
[AD-A070099] N79-32916
The AQ algorithm for the solution of a sparse system of linear equations
[NPL-DNACS-17/79] N79-32928
Estimation of the mean of a normal distribution with singular covariance matrix
[AD-A069565] N79-32956

MATRIX METHODS
Frequency analysis of a thick-rim flywheel
[ORNL/TM-5804] N79-32555

MAXIMUM LIKELIHOOD ESTIMATES
Reexamination of the estimation of undiscovered oil resources in the US
[DOE/EIA-0103/31] N79-32618
Estimation of the operating characteristics of item response categories. 7: Bivariate P.D.F. approach with normal approach with normal approach method
[AD-A070130] N79-32950
Estimation of the mean of a normal distribution with singular covariance matrix
[AD-A069565] N79-32956

MAXWELL EQUATION
Asymptotic rounds for solutions to a system of damped integrodifferential equations of electromagnetic theory
[AD-A070132] N79-32432

MEAN
The evaluation and control of the changes in basic statistics encountered in grouped data --- normally distributed data
N79-32943
Estimation of the mean of a normal distribution with singular covariance matrix
[AD-A069565] N79-32956

MEASURING INSTRUMENTS
Design fabrication and installation of a yaw measuring device
[NASA-CR-161300] N79-32526

MECHANICAL PROPERTIES
Research Workshop on Mechanics of Composite Materials
N79-32267
Selecting aluminum alloys to resist failure by fracture mechanisms
[ALCOA-57-77-24-REV] N79-32323
Aluminum alloys for advanced structural applications in transport aircraft
[NLR-MP-77023-U] N79-32344
Formation and properties of rubber-modified epoxies
N79-32357
Numerical analysis of pressure vessels using various shell theories
[IIT-B/CF-79-1] N79-32576
Numerical analysis of pressure vessels using various shell theories: Introduction
N79-32577
Problem formulation --- governing equations for the behavior of general shell forms
N79-32579
A survey of packaging for solidified low-level radioactive waste --- studying containers for underground storage
[PB-295038/4] N79-33011

MEDIA
Guided wave propagation in bounded inhomogeneous media
N79-32405

MEDITERRANEAN SEA
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609

MEMBRANE STRUCTURES
Lateral diffusion in model membranes by pulsed nuclear magnetic resonance --- to investigate molecular dynamics of liquid crystal systems
N79-32978

MEMBRANES
For today: Membrane-produced gasahol. For tomorrow: Membrane-produced alcohol
[PB-295814/8] N79-32395

MEMORY
A comparison of verbal and visual imagery learning stategies: Their importance for instrumental technology
[AD-A069983] N79-32833

MENTAL PERFORMANCE
Human performance in time-shared verbal and tracking tasks
[AD-A070275] N79-32831

MESAS
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
[E79-10271] N79-32605

MESON RESONANCES
Electrons and kaons in charmed particle decays --- produced in electron-positron annihilation
[LBL-9017] N79-33003

METAL COATINGS
A microstructural investigation of plasma-sprayed metal and oxide coatings
N79-32320

METAL CRYSTALS
Application of ion channeling to radiation damage studies --- for depth profiling of intrinsic defects in metals
[SAND-79-0497C] N79-32990

METAL FATIGUE
Fatigue behavior of TiNi alloy
N79-32319
Microstructural evaluation and non-destructive examination of 2.25 Cr-1 Mo steel
[SAND-77-1557] N79-32340
The effect of sheet thickness on flight simulation fatigue crack propagation in 2024-T3, 7475-T761, and mill annealed Ti-6Al-4V
[NLR-MP-77024-U] N79-32345
Quantitative models of hydrogen embrittlement in high strength steel
[NLR-MP-78024-U] N79-32347
Fatigue testing of titanium 6Al4V
[FFA-TN-HU-1993] N79-32348

METAL FILMS
Computer modeling of film growth and resistance estimation of semi-continuous metal films
N79-32317

METAL HYDRIDES
Metal hydride technology --- hydrogen bonding with intermetallics
[BNL-26047] N79-32387
Stability of the lanthanide hydrides
[LA-7602-MS] N79-32991

METAL MATRIX COMPOSITES
Plasticity of composite laminates
N79-32269
Boron reinforced composites, volume 2. A bibliography with abstracts
[NTIS/PS-79/0476/6] N79-32292

METAL OXIDE SEMICONDUCTORS
Device model for FETSIM circuit simulation program
[NASA-CR-150321] N79-32465
LSI process development
[BDX-613-2138-REV] N79-32478
Radiation effects in Ga As AMOS solar cells
N79-32667

Capacitance transients in p-type GaAs MOS structures and application to lifetime mapping during solar cell fabrication
N79-32668
An investigation of factors affecting the semiconductor-to-metal transition of V[1-x]W[x]O[2]
N79-33076
A study of flicker noise in MOSFETS
[AD-A070313] N79-33080

METAL POWDER
Experimental evaluation of peak height approximation for X-ray diffracted integrated intensity method
[AD-A070800] N79-32329
Machining powder metallurgy materials
[AD-A070913] N79-32336

METAL SHEETS
Environmental fatigue crack propagation in metal/composite laminates --- flight simulation tests
[NLR-TR-77122-U] N79-32288
The effect of sheet thickness on flight simulation fatigue crack propagation in 2024-T3, 7475-T761, and mill annealed Ti-6Al-4V
[NLR-MP-77024-U] N79-32345
Effect of sheet metal thickness on crack propagation --- Duralumin
[ISD-240] N79-32593

METAL SURFACES
Photoemission studies of H2S, H2, and S adsorbed on Ru[110]: Evidence for an adsorbed SH species
[AD-A070054] N79-32307
Some linear differential equation problems in the analysis of dissolved species in cracks
[NPL-DNACS-14/79] N79-32927
Damage of metal surfaces by a hot dense deuterium plasma --- using unipolar arcing for the study of fusion reactor materials
[COO-4393-03] N79-33057
Study of the inhomogeneous electron gas at surfaces --- for investigation many body problems and density profiles at surfaces
N79-33069

METALLURGY
Extraction processes for the production of aluminum, titanium, iron, magnesium, and oxygen and nonterrestrial sources
N79-32240
Implantation metallurgy
[SAND-78-1089C] N79-32341

METALS
Evaluation of candidate metals in a simulated space shuttle main engine environment for application as turbine blade dampers
[NASA-CR-161299] N79-32325
Pseudopotential methods in the calculation of electronic properties and quadrupole interactions in metals
N79-33074

METEORITES
Studies of noble gases in meteorites and in the earth
N79-33135

METEOROLOGICAL PARAMETERS
Meteorological data for solar energy applications
N79-32733
Spectral measurements of infrared sky radiance
[LBL-8778] N79-32776
Meteorological rocket network system reliability
[AD-A070187] N79-32808
The 14818C Lance, missile number 3398, round no. 328 APT
[AD-A070489] N79-32809
Summaries of weather observatories at weather stations in Greenland from 1966 to 1970
[ISBN-87-7478-156-1] N79-32813
Interduration precipitation relations for storms: Southeast states
[PB-297192/7] N79-32815

METEOROLOGICAL SATELLITES
SIRIO 2: Satellite for European Space Agency. Executive summary
N79-32252

METEOROLOGICAL SERVICES
Aviation automated weather observation system [AV-AWOS]
[AD-A072119] N79-32805

METEOROLOGY
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model --- Los Angeles, California and St. Louis, Missouri
[E79-10269] N79-32604
Proceedings of the 8th Technical Exchange Conference
[AD-A070009] N79-32806
The 14818C Lance, missile number 3398, round no. 328 APT
[AD-A070489] N79-32809
Statistical adjustment of dynamical tropical cyclone model track predictions
[AD-A070094] N79-32810
Meteorological Effects of Thermal Energy Releases [METER] program
[ORNL/TM-6248] N79-32812

METHANE
A study of homogeneous reduction of carbon monoxide to hydrocarbons and methanol
N79-32368
Fuels from magma: A potential energy source --- producing hydrogen, carbon monoxide, and methane
[SAND-78-0191] N79-32373
Fixed bed methanation processes
[FE-2240-96] N79-32382
Methane recovery from coalbeds project technology test projects evaluation of candidate projects
[DOE/TIC-10128] N79-32390
Comparison of alternate fuels for aircraft --- liquid hydrogen, liquid methane, and synthetic aviation kerosene
[NASA-TM-80155] N79-32637
The visual and near infrared spectrum of methane and its application to Uranus, Neptune, Triton and Pluto
N79-33119

METHODOLOGY
Comparison of some methods for measuring speech levels
[IZF-1978-22] N79-32976

METHYL ALCOHOLS
Screening of zeolite catalysts for methanol conversion to light hydrocarbons
[COO-4691-1] N79-32386

METHYL COMPOUNDS
Ultraviolet absorption spectrum of methylchloroform in the vapor phase
[AERONOMICA-ACTA-A-203-1979] N79-32766

METROLOGY
The ampere, the kilogram, and the fundamental constants. Is there a weighing problem?
[NPL-QU-52] N79-32399
Activities of the Division of Quantum Metrology
[NPL-QU-AR-77] N79-32400
Activities of the Division of Quantum Metrology
[NPL-QU-AR-78] N79-32401

MEXICO
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
[E79-10271] N79-32605

MICHAELIS THEORY
Estimation of rate constants in the Michaelis-Menten model
[AD-A070360] N79-32824

MICROANALYSIS
Nanogram techniques. 2: Microscale preparative gas chromatography
[NRC/CNR-TT-1951] N79-32304
Nanogram techniques. 1: Injection without losses on capillary columns
[NRC/CNR-TT-1950] N79-32305
Microscopic investigation of electrostatic discharge phenomena on nonconductive optical solar reflectors with a conductive adhesive
[ESA-STM-211] N79-32729

MICROCLIMATOLOGY
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model --- Los Angeles, California and St. Louis, Missouri
[E79-10269] N79-32604

MICROCOMPUTERS
Flexible disk file structures for microcomputer systems
N79-32851

MICROMETEORITES
Measurement of the velocity of small projectiles using microwaves
[TUM-LRT-RT-TB-77/01] N79-32444
Heating of spherical interplanetary particles close to the sun [solar probe HELIOS A and B: Experiment 10 z]
[BMFT-FB-W-78-33] N79-33145

MICROMETEOROLOGY
Guide for estimating dry deposition velocities of sulfur over the eastern United States and surrounding regions
[ANL/RER-79-2] N79-32750

MICROMILLIAMMETERS
Optically isolated logarithmic nanoammeter capable of floating to 5 kilovolts
[NASA-TP-1527] N79-32467

MICROPROCESSORS
Studies in electrochemistry. 1: Microprocessor controlled electrochemistry. 2: Thiamine electrochemical oxidation reactions
N79-32301
Microprocessor-controlled autonomous sun-following mount for solar photovoltaic energy planning
[COO-4094-34] N79-32702
A microprocessor based image storage and analysis facility for infrared signature measurement and image processing
[AD-A070288] N79-32858
Microprocessor as an intelligent interface between flight data acquisition equipment and a minicomputer
[NLR-MP-78007-U] N79-32861
Design of software tools for microprogrammable microprocessors
[TRITA-NA-79-03] N79-32886

MICROPROGRAMMING
Design of software tools for microprogrammable microprocessors
[TRITA-NA-79-03] N79-32886

MICROSTRUCTURE
Fatigue behavior of TiNi alloy
N79-32319
A microstructural investigation of plasma-sprayed metal and oxide coatings
N79-32320
Low cycle fatigue properties of MAR-M-246 Hf in hydrogen --- a cast nickel-base alloy
[NASA-CR-161296] N79-32324
Acoustic emission behavior of a low alloy steel --- pressure vessels
[AD-A069965] N79-32339
Microstructural evaluation and non-destructive examination of 2.25 Cr-1 Mo steel
[SAND-77-1557] N79-32340

MICROTRONS
Microtron injector for LEP
[TRITA-EPP-79-05] N79-33009

MICROWAVE AMPLIFIERS
Millimeter wave low noise front end
[CD.6500636] N79-32487

MICROWAVE FREQUENCIES
Atmospheric propagation research at 20 and 30 GHz
[ESA-CR[P]-1201] N79-32447
High microwave frequency passive components
[AD-A070348] N79-32469

MICROWAVE LANDING SYSTEMS
Trials of the Doppler microwave landing system at London [Gatwick] Airport, August 1977
[RAE-TR-78124] N79-32194
Trials of the Doppler microwave landing system at Manchester International Airport, October/November 1977
[RAE-TR-78144] N79-32195

MICROWAVE TRANSMISSION
Microwave communication, volume 2. A bibliography with abstracts
[NTIS/PS-79/0525/0] N79-32454
Automated digital system engineering model
[PB-294960/0] N79-32457
Microwave applications processing system: A user's guide
[PB-294692/9] N79-32458

MICROWAVES
Numerical calculations on the propagation of microwaves in highly over-dense magnetized plasma
[IPPJ-404] N79-33028
Microwave experimental simulation of laser plasma interactions
[UCLA-ENG-7931] N79-33051
Electron-cyclotron heating of toroidal plasma with emphasis on results from the ELMO Bumpy Torus [EBT]
[ORNL/TM-6703] N79-33052

MIGRATION
Improvement of the MVD method [Migration Velocity Determination]
[BMFT-FB-T-78-30] N79-32779

MILITARY AIRCRAFT
Experimental methods for aircraft design qualifications in an exploding warhead environment
[AD-A070381] N79-32203

MILITARY HELICOPTERS
Preliminary airworthiness evaluation CH-47C with fiberglass rotor blades with T55-L-712 engines
[AD-A069891] N79-32199
Flight test results of a virtual image, pantograph mounted, control and display station
[AD-A070290] N79-32207

MILITARY OPERATIONS
Fiber optics for tactical communications
[AD-A070274] N79-33015

MILITARY SPACECRAFT
Military satellite communications, history and status as of 1974
[NRL-TR-74173-U] N79-32254

MILITARY TECHNOLOGY
A review of Air Force high efficiency cascaded multiple bandgap solar cell research and development
N79-32670

MILLIMETER WAVES
A millimeter wave attenuation and depolarization experiment using the COMSTAR and CTS satellites
[NASA-CR-162315] N79-32442
Millimeter wave low noise front end
[CD.6500636] N79-32487

MINERAL DEPOSITS
An assessment of near-earth asteroid resources
N79-32235

MINERALS
A geologic assessment of potential lunar ores
N79-32239
Extraction processes for the production of aluminum, titanium, iron, magnesium, and oxygen and nonterrestrial sources
N79-32240
Mining and beneficiation of lunar ores
N79-32241

MINES [EXCAVATIONS]
Methane recovery from coalbeds project technology test projects evaluation of candidate projects [DOE/TIC-10128] N79-32390
MINICOMPUTERS
Microprocessor as an intelligent interface between flight data acquisition equipment and a minicomputer [NLR-MP-78007-U] N79-32861
MINIMAX TECHNIQUE
On maximum error and boundary conditions in cubic spline interpolation at equidistant knots [TRITA-NA-79-02] N79-32938
MINING
Retrieval of asteroidal materials N79-32234
MINNESOTA
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota [E79-10264] N79-32603
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data [E79-10283] N79-32608
MIRRORS
Evaluation of cellular glasses for solar mirror panel applications [NASA-CR-162303] N79-32634
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 1: Study overview and summary [NASA-CR-162328] N79-32638
MIS [SEMICONDUCTORS]
Investigation of low cost solar cells based on Cu2O --- MIS solar cell theory [PB-295888/2] N79-32737
MISSILE CONFIGURATIONS
Some aerodynamic performance calculations on missile configurations [AD-A070433] N79-32168
Aerodynamic heating in the fin interaction region of generalized missile shapes at Mach 6 [modular missile test program] --- wind tunnel tests [AD-A071573] N79-32173
Aerodynamic stability technology for maneuverable missiles. Volume 1: Configuration aerodynamic characteristics [AD-A070250] N79-32250
MISSION PLANNING
Space resources and space settlements [NASA-SP-428] N79-32225
Round-trip missions to low delta-V asteroids and implications for material retrieval N79-32233
ARIANE Passenger Experiment [APEX]: Planning study [BMFT-FB-W-77-24] N79-32244
SIRIO 2: Satellite for European Space Agency. Executive summary N79-32252
Mission analysis for the Federal Fuels from biomass program. Volume 1: Summary and conclusions [SAN-0115-T2] N79-32385
Planetary data system requirements: Multi-mission radio science requirements for the 1978 to 1988 era [NASA-CR-162306] N79-33139
MISSOURI
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model --- Los Angeles, California and St. Louis, Missouri [E79-10269] N79-32604
MODAL RESPONSE
Modal interpolation program. L215 [INTERP]. Volume 1: Engineering and usage [NASA-CR-2847] N79-32164
MODULATION TRANSFER FUNCTION
Applications of the modulation transfer function in room acoustics [IZF-1978-19] N79-32975
MODULES
A preliminary assessment of small steam Rankine and Brayton point-focusing solar modules [NASA-CR-162302] N79-32632
MOISTURE CONTENT
Prevention of early pavement deterioration --- due to moisture in asphalt mixes, temperature susceptibility, and transverse cracking [PB-296337/9] N79-32402
MOLDING MATERIALS
A filled silicone rubber materials system with selectable acoustic properties for molding and coating applications at ultrasonic frequencies [AD-A070461] N79-32972
MOLECULAR BEAMS
Investigation of electron attachment in polyatomic molecules --- sulfur hexafluoride, molybdenum hexafluoride, and tungsten oxide vapor [AD-A070069] N79-32985
MOLECULAR DIFFUSION
Some linear differential equation problems in the analysis of dissolved species in cracks [NPL-DNACS-14/79] N79-32927
MOLECULAR ENERGY LEVELS
Internal energy transfer in isolated molecules: Ergodic and nonergodic behavior [AD-A071021] N79-32984
MOLECULAR EXCITATION
Internal energy transfer in isolated molecules: Ergodic and nonergodic behavior [AD-A071021] N79-32984
Vibrational energy transfer in selectively excited diatomic molecules [LBL-8208] N79-32987
MOLECULAR INTERACTIONS
Limiting mechanisms of dislocation motion in ice N79-32602
Lateral diffusion in model membranes by pulsed nuclear magnetic resonance --- to investigate molecular dynamics of liquid crystal systems N79-32978
Shock tube studies of reaction and energy transfer rates between molecules and reactive atoms N79-32980
Internal energy transfer in isolated molecules: Ergodic and nonergodic behavior [AD-A071021] N79-32984
MOLECULAR RELAXATION
Vibrational energy transfer in selectively excited diatomic molecules [LBL-8208] N79-32987
MOLECULAR STRUCTURE
Automated geometry optimization for ground states of molecules N79-32977
MOLECULES
Shock tube studies of reaction and energy transfer rates between molecules and reactive atoms N79-32980
MOLTEN SALTS
Corrosion in molten salts used for solar thermal storage applications [SAND-79-0246C] N79-32683
MOLYBDENUM
The effects of composition and carbide precipitation of temper embrittlement of 2 1/4 Cr-1 Mo steels N79-32322
MOLYBDENUM COMPOUNDS
Investigation of electron attachment in polyatomic molecules --- sulfur hexafluoride, molybdenum hexafluoride, and tungsten oxide vapor [AD-A070069] N79-32985
MONTANA
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data [E79-10283] N79-32608
MONTE CARLO METHOD
A Monte Carlo comparison of some ridge and other biased estimators [AD-A069566] N79-32955
Statistical thermodynamics of sorption in molecular sieves N79-33095
MOON
Lunar studies [NASA-CR-162318] N79-33141
MORPHOLOGY
Formation and properties of rubber-modified epoxies N79-32357
MOSAICS
Georgia from space: An explanation of the NASA LANDSAT 1 satellite image color mosaic of the state of Georgia [CIRC-787] N79-32613
MULTICHANNEL COMMUNICATION
The conclave computer teleconferencing system [NPL-COM-107] N79-32446
A multichannel digital sound recorder [BBC-RD-1979/15] N79-32524
MULTIPLE OUTPUT PROGRAMS
Update synchronization in multiaccess database systems N79-32845
MULTIPLICATION
A proposal for the use of new parallel multiplication and division algorithms, modeled after Egyptian and Babylonian prototypes [CTH-MATH-1979-5] N79-32933
MULTIPLIERS
Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules [AD-A070052] N79-32472
Some further developments of the iterative digital cellular multiplier [NPL-DES-51] N79-32860
MULTIPROCESSING [COMPUTERS]
The effect of program behavior upon interleaved memory bandwidth in a multiprocessor environment [AD-A070115] N79-32855
A nonlinear multiprocessor scheduling problem N79-32869
MULTISPECTRAL PHOTOGRAPHY
Advanced training and research on satellite remote sensing techniques and applications in the United Kingdom and the United States, 1 October 1977 to 30 September 1978 [AGLT/RSU-SERIES-2/79] N79-32622
MUONS
Meson factories --- and their applications [LA-UR-79-1236] N79-32989
MYOCARDIUM
Oxygen delivery in the hypoxic perfused heart: Relation to functional and metabolic changes N79-32825

N

NASA PROGRAMS
Aeronautics and space report of the President, 1978 activities N79-33115
NASTRAN
Effect of element density on the NASTRAN calculated mechanical and thermal stresses of a spar [NASA-TM-72868] N79-32151
NATIONS
Summary of national and international radioactive waste management programs [PNL-2941] N79-32995
NATURAL LANGUAGE [COMPUTERS]
An experimental natural-language processor for generating data type specifications N79-32847
Cooperative responses from a portable natural language data base query system N79-32867
NAVIER-STOKES EQUATION
Vorticity-stream function formulation of compressible and incompressible turbulent flows [AD-A070043] N79-32501
The performance of a vectorized 3-D Navier-Stokes code on the CRAY-2 computer [AD-A071137] N79-32510
Time-dependent FEM solution of the incompressible Navier-Stokes equations in two and three-dimensions [UCRL-81323] N79-32517
NAVIGATION AIDS
Recognition of the aircraft navigation light colour code N79-32186
Navaid calibration evaluation with a computer controlled avionics data acquisition system [NLR-MP-78030-U] N79-32193
NAVIGATION SATELLITES
The effects of the troposphere on Doppler-navigated station positions [AD-A070184] N79-32188
NAVIGATION TECHNOLOGY SATELLITES
An interim report on the NTS-2 solar cell experiment N79-32656
NAVSTAR SATELLITES
Navstar-Global Positioning System [GPS] Army User Equipment [AUE] Required Operational Capability [ROC] [AD-A070139] N79-32189
NAVY
Navy air-launched missile operating and support cost estimating model [AD-A069527] N79-32251
NEBRASKA
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data [E79-10283] N79-32608
NEPTUNE [PLANET]
The visual and near infrared spectrum of methane and its application to Uranus, Neptune, Triton and Pluto N79-33119
Neptune: Limb brightening within the 7300 angstrom methane band [NASA-CR-162319] N79-33122
NEPTUNE ATMOSPHERE
Neptune: Limb brightening within the 7300 angstrom methane band [NASA-CR-162319] N79-33122
NERVES
Effects of acute noise traumata on whole-nerve and single-unit activity [IZF-1978-23] N79-32829
NETWORK ANALYSIS
Computer networks [AD-A070223] N79-32423
Optimization of future telecommunication network structures [BMFT-FB-T-78-55] N79-32448
Meteorological rocket network system reliability [AD-A070187] N79-32808
Definition and verification of computer network protocols [NPL-DNACS-15/79] N79-32885
NETWORK SYNTHESIS
Dependency networks as a representation for modelling in general problem solvers N79-32889

NEUTRAL BEAMS
Preliminary experiment of neutral beam injection heating in JIPP T-2 device
[IPPJ-392] N79-33027
NEUTRON BEAMS
Tests on a 50tera neutron generator
[BMVG-FBWT-78-14] N79-33006
NEUTRON CROSS SECTIONS
Coupled neutron and photon cross sections for transport calculations
[LA-7808-MS] N79-32988
NEUTRON IRRADIATION
Materials considerations for Inertially-Confined Fusion Reactors [ICFR]
[UCRL-81206] N79-33049
NEVADA
Nevada nuclear waste storage investigations
[NVO-196-9] N79-32997
NEW MEXICO
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
[E79-10271] N79-32605
Performance testing of the Del concentrating solar collector
[SAND-79-0515] N79-32681
NEW YORK
Assessment of hydropower restoration and expansion in New York State, volume 1
[PB-295782/7] N79-32734
NEWTON-RAPHSON METHOD
On numerical analysis in semi-infinite programming
[TRITA-NA-79-07] N79-32887
NEWTONIAN FLUIDS
Pneumatic atomization of viscoelastic fluids N79-32493
NICKEL ALLOYS
Fatigue behavior of TiNi alloy N79-32319
Low cycle fatigue properties of MAR-M-246 Hf in hydrogen --- a cast nickel-base alloy
[NASA-CR-161296] N79-32324
Fracture along planar slip bands
[AD-A070788] N79-32585
NICKEL CADMIUM BATTERIES
Computerized pattern recognition applied to Ni-Cd cell lifetime prediction
[AD-A070344] N79-32675
NIGHT SKY
Rocket-based measurement of Birkeland currents in an active post-midnight aurora N79-32762
NITRIC OXIDE
Reduction of nitric oxide by carbon monoxide over a silica supported platinum catalyst: Infrared and kinetic studies
[LBL-8007] N79-32312
NITROGEN
Temperature, molecular nitrogen concentration and turbulence in the lower thermosphere inferred from incoherent scatter data
[AERONOMICA-ACTA-A-204-1979] N79-32767
NITROGEN OXIDES
Measured effects of boundary conditions on oxides of nitrogen produced by liquid fuel diffusion flames N79-32302
Early formation of nitrogen oxides during combustion of hydrocarbons
[ONERA-NT-1978-4] N79-32314
Long term effect on the ozone layer of nitrogen oxides produced by thermonuclear explosions in the atmosphere
[AERONOMICA-ACTA-A-198-1979] N79-32763
NOISE [SOUND]
Experimental superposition of acoustic fields for detection performance studies
[AD-A070963] N79-32970
NOISE INJURIES
Effects of acute noise traumata on whole-nerve and single-unit activity
[IZF-1978-23] N79-32829
NOISE MEASUREMENT
Investigation of noise in soilds at low temperatures
[AD-A070016] N79-33086
NOISE POLLUTION
Laboratory study of annoyance to combined airplane and road-traffic noise
[NASA-TP-1478] N79-32743
A summation and inhibition model of annoyance response to multiple community noise sources
[NASA-TP-1479] N79-32744
Tentative evaluation of annoyance caused by noise from gunfire
[IZF-1978-21] N79-32843
Paratransit vehicle test and evaluation. Volume 5: Noise tests
[PB-295479/0] N79-33110
NOISE PREDICTION [AIRCRAFT]
Acoustic analysis of the propfan
[NASA-CR-162312] N79-32210
NOISE REDUCTION
An experimental investigation of the acoustic characteristics of a variety of slot baffle configurations for transonic wind tunnel walls
[AD-A070261] N79-32223
An investigation into the noise interference problems at Logan Airport, Boston
[AD-A072057] N79-32417
A summation and inhibition model of annoyance response to multiple community noise sources
[NASA-TP-1479] N79-32744
NOISE SPECTRA
Noise in coherent optical systems: Minimum detectable object contrast and speckle smoothing
[AD-A070040] N79-33014
NOISE THRESHOLD
Commercial aircraft flight deck noise criteria
[AD-A072029] N79-32969
NOISE TOLERANCE
Laboratory study of annoyance to combined airplane and road-traffic noise
[NASA-TP-1478] N79-32743
Commercial aircraft flight deck noise criteria
[AD-A072029] N79-32969
NONDESTRUCTIVE TESTS
NDE method for characterizing anodized Al surfaces
[AD-A070936] N79-32337
Microstructural evaluation and non-destructive examination of 2.25 Cr-1 Mo steel
[SAND-77-1557] N79-32340
Multifrequency eddy current inspection for cracks under fasteners, phase 2
[AD-A071102] N79-32560
Highly efficient transducer arrays useful in nondestructive testing applications
[AD-A070725] N79-32562
Proceedings of the ARPA/AFML Review of Progress in Quantitative Nondestructive Evaluation
[AD-A071047] N79-32563
Preliminary testing results for the application of a nondestructive evaluation technique utilizing the phenomenon of internal friction for detecting crack formation in a scale model of an offshore structure
[AD-A069535] N79-32564
Simulated neutron tomography for nondestructive assays
[LA-UR-79-938] N79-32565
NONFLAMMABLE MATERIALS
Release-rate calorimetry of multilayered materials for aircraft seats
[NASA-TM-78594] N79-32265
NONLINEAR EQUATIONS
Semidirect methods for discretized nonlinear partial differential equations, with particular applications to fluid dynamics
[AD-A069596] N79-32514
Searching for solutions of finite nonlinear systems: An interval approach N79-32903
Some nonlinear problems in transonic helicopter acoustics
[AD-A069564] N79-32974
NONLINEAR FILTERS
Practical control algorithms for nonlinear stochastic systems and investigations of nonlinear filters
[AD-A069980] N79-32953
NONLINEAR PROGRAMMING
A nonlinear multiprocessor scheduling problem N79-32869
NONLINEAR SYSTEMS
Some relations between nonexpansive and order preserving mappings
[AD-A070202] N79-32918
Efficient time-stepping methods for miscible displacement problems with nonlinear boundary conditions
[AD-A070211] N79-32922
Parametrically excited nonlinear multidegree-of-freedom systems --- the parametric excitation is harmonic N79-32967
NONNEWTONIAN FLUIDS
Pneumatic atomization of viscoelastic fluids N79-32493
Transient flow of non-Newtonian power-law fluids in porous media
[SAN-1265-9] N79-32516
NONSTABILIZED OSCILLATION
The transonic oscillating flap
[AD-A070022] N79-32200
Application of various theories to kinematic shimmy studies
[TUM-MW-14-7701] N79-32550
NONUNIFORM PLASMAS
Simulation of lower-hybrid heating in a nonuniform plasma slab
[AD-A070491] N79-33041
NORMAL DENSITY FUNCTIONS
The evaluation and control of the changes in basic statistics encountered in grouped data --- normally distributed data N79-32943

Estimation of the mean of a normal distribution with singular covariance matrix
[AD-A069565] N79-32956
NORTH DAKOTA
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data
[E79-10283] N79-32608
NORTH SEA
Satellite monitoring of sea surface pollution --- North Sea
[E79-10287] N79-32611
NOSE CONES
A correlation of artificially induced boundary-layer transition data from blunt slender cones at hypersonic speeds
[AD-A070446] N79-32165
NOTCH SENSITIVITY
Effect of deep wedge-shaped notches of small flank angle on plastic failure
[OUEL-1282/79] N79-32598
NOTCH STRENGTH
Residual strength of Kevlar-carbon/epoxy hybrid composite materials
[NLR-TR-78008-U] N79-32289
NOTCH TESTS
Some investigations on the notching procedure used in shaker tests on satellites
[NLR-TR-76134-U] N79-32255
Temperature based stress analysis of notched members
[AD-A070372] N79-32589
NOZZLE FLOW
Analysis of two-phase flow in nozzles and turbine buckets
[AD-A070754] N79-32506
NUCLEAR EMULSIONS
The cosmic ray boron and carbon isotopic composition measured in nuclear emulsions
[LUIP-7906] N79-33149
NUCLEAR ENERGY
Nuclear safeguards research and development
[LA-7616-PR] N79-32996
NUCLEAR EXPLOSIONS
Seismological studies using observed and synthetic waveforms --- included are wave amplitudes from earthquakes and nuclear explosions N79-32757
NUCLEAR FUEL REPROCESSING
Summary of national and international radioactive waste management programs
[PNL-2941] N79-32995
NUCLEAR FUELS
Long-term storage of irradiated CANDU fuel under water
[AECL-6313] N79-32999
NUCLEAR FUSION
Advanced synfuel production with fusion
[BNL-26130] N79-32388
Electromagnetic field and mechanical stress analysis code. Appendix A: Preliminary conceptual design study of the riggatron approach to fusion power
[DOE/TIC-4068-T2-APP-A] N79-32443
Definition and conceptual design of a small fusion reactor
[EPRI-ER-1045] N79-33004
Sandia's particle beam fusion program
[SAND-79-0600C] N79-33005
Generation of a rotating liquid liner by tangential injection
[AD-A070890] N79-33038
Optimization of stabilized imploding liner fusion reactors
[AD-A070889] N79-33046
Damage of metal surfaces by a hot dense deuterium plasma --- using unipolar arcing for the study of fusion reactor materials
[COO-4393-03] N79-33057
Nucleosynthesis in supernovae and the origin of isotopic heterogeneity in the early solar system N79-33126
NUCLEAR HEAT
Research and development work for hydrogasification of coal with nuclear processing heat done in the framework of the prototype nuclear processing heater project
[BMFT-FB-T-78-25] N79-32393
Research and development concerning steam gasification of coal: Report on the concept of a prototype plant using nuclear processing heat
[BMFT-FB-T-78-29] N79-32394
NUCLEAR ISOBARS
Symmetry breaking in nuclei --- involving isospin and parity N79-32993
NUCLEAR MAGNETIC RESONANCE
Lateral diffusion in model membranes by pulsed nuclear magnetic resonance --- to investigate molecular dynamics of liquid crystal systems N79-32978
Fourier transform nuclear magnetic resonance spectroscopy applications of chemical interest N79-32979

NUCLEAR PUMPED LASERS
Nuclear-pumped lasers 2
[NASA-CR-162320] N79-32539
NUCLEAR PUMPING
Nuclear-pumped lasers 2
[NASA-CR-162320] N79-32539
NUCLEAR REACTIONS
Properties of multistep amplitudes in charge-exchange reactions
[UCRL-82665] N79-33002
Radioisotope production with electron accelerators
[REPT-78/5] N79-33007
NUCLEAR SPIN
Symmetry breaking in nuclei --- involving isospin and parity
N79-32993
NUCLEATION
Phase transformations in Ti alloys: A review of recent developments
[AD-A070906] N79-32330
NUCLEI [NUCLEAR PHYSICS]
Symmetry breaking in nuclei --- involving isospin and parity
N79-32993
NULL ZONES
Radiation pattern sidelobes and null filling produced by aircraft vibration
[AD-A070472] N79-32422
NUMERICAL ANALYSIS
Acoustic analysis of the propfan
[NASA-CR-162312] N79-32210
The viscoelastic response of composite materials
N79-32268
A high-order theory of laminated plate deformation
N79-32274
Development of random choice numerical methods for blast wave problems
[AD-A071156] N79-32439
Numerical analysis of pressure vessels using various shell theories
[IIT-B/CE-79-1] N79-32576
Numerical analysis of pressure vessels using various shell theories: Introduction
N79-32577
Numerical analysis --- analysis methods for pressure vessesl
N79-32580
Numerical results --- analysis of pressure vessels using various shell theories
N79-32581
Numerical analysis of pressure vessels using various shell theories: Discussions and conclusions
N79-32582
Micellar/polymer floods for enhanced oil recovery: A review of displacement mechanisms and their simulation
[ANL/ES-74] N79-32620
Numerical solution to the inverse problem of the geodetic ellipsoid of revolution
[SER-B-228-MITT-145] N79-32778
A brief guide to NPL Algorithms Library, 1979
[NPL-CSU-3/79] N79-32884
Numerical calculations on the propagation of microwaves in highly over-dense magnetized plasma
[IPPJ-404] N79-33028
NUMERICAL CONTROL
Astronomical spectroscopy through real time computer control of photodiode array detectors
N79-33120
NUMERICAL INTEGRATION
Multidimensional quadrature formulas using partial derivates
[AD-A070582] N79-32915
Some properties of linear multistep and one-leg methods for ordinary differential equations
[TRITA-NA-79-04] N79-32939
Numerical integration of the orbit-averaged Fokker-Planck equation: The evolution of Plummer's model --- for studying the evolution of star clusters
N79-33117
NUMERICAL STABILITY
Some stability properties of linear multistep compound discretizations of partitioned differential systems
[TRITA-NA-79-10] N79-32941
Computations related to G-stability of linear multistep methods
[TRITA-NA-79-11] N79-32942
NUMERICAL WEATHER FORECASTING
Use of Galerkin methods in numerical weather prediction
[AD-A070458] N79-32807

O

OBLIQUE WINGS
The oblique wing as a lifting-line problem in transonic flow
[AD-A070232] N79-32166
OBSERVATION
Techniques for observation and control of high voltage spark discharge
N79-32460
On the structures of HII regions and their distribution in the galaxy
N79-33131
OCEAN BOTTOM
Basic remote sensing investigation for coastal reconnaissance
[AD-A070770] N79-32615
Development of multifunctional sea-floor instrumental systems
[SAND-78-0781C] N79-32820
A summary of the results of a study of acoustic interaction with the sea floor
[AD-A070954] N79-32973
OCEAN CURRENTS
Renewable ocean energy sources. Part 2: Working papers: ocean winds, currents, waves, tides and salinity gradients
[PB-295876/7] N79-32735
Winter circulation and hydrography over the continental shelf of the north gulf of Alaska
[PB-296914/5] N79-32821
OCEAN MODELS
Climate modeling --- for use in understanding earth's radiation budget
N79-32799
OCEAN SURFACE
Satellite monitoring of sea surface pollution --- North Sea
[E79-10287] N79-32611
OCEAN THERMAL ENERGY CONVERSION
Dynamic modeling, simulation and control of ocean thermal energy conversion power plants
N79-32627
Renewable ocean energy sources. Part 2: Working papers: ocean winds, currents, waves, tides and salinity gradients
[PB-295876/7] N79-32735
Energy programs at the Johns Hopkins University Applied Physics Lab. --- geothermal, hydroelectric, and ocean thermal energy
[PB-295439/4] N79-32739
OCEANS
Report to the Congress on ocean dumping research. Public law 92-532, title 2, section 201
[NOAA-S/T-77-2838] N79-32741
Investigation of the long-wavelength gravity field of the oceans
[AD-A064662] N79-32818
OFFSHORE PLATFORMS
Preliminary testing results for the application of a nondestructive evaluation technique utilizing the phenomenon of internal friction for detecting crack formation in a scale model of an offshore structure
[AD-A069535] N79-32564
OIL FIELDS
Reexamination of the estimation of undiscovered oil resources in the US
[DOE/EIA-0103/31] N79-32618
OIL POLLUTION
Satellite monitoring of sea surface pollution --- North Sea
[E79-10287] N79-32611
OIL RECOVERY
Micellar/polymer floods for enhanced oil recovery: A review of displacement mechanisms and their simulation
[ANL/ES-74] N79-32620
OIL SLICKS
Satellite monitoring of sea surface pollution --- North Sea
[E79-10287] N79-32611
OKLAHOMA
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data
[E79-10283] N79-32608
OMNIDIRECTIONAL ANTENNAS
The 3 kHz SQUID receiver development
[AD-A069709] N79-32429
OMNIDIRECTIONAL RADIO RANGES
Navaid calibration evaluation with a computer controlled avionics data acquisition system
[NLR-MP-78030-U] N79-32193
OPEN CHANNEL FLOW
Generation of a rotating liquid liner by tangential injection
[AD-A070890] N79-33038
OPENINGS
Apex singularities for corner cracks under opening, sliding, and tearing modes
[AD-A070200] N79-32587
OPERATING SYSTEMS [COMPUTERS]
Computer performance measurement tools and techniques
N79-32849
OPERATIONS RESEARCH
Optimization of future telecommunication network structures
[BMFT-FB-T-78-55] N79-32448
Global and superlinear convergence of a class of variable metric methods
[AD-A070204] N79-32959
Local and superlinear convergence of a class of variable metric methods
[AD-A070208] N79-32960
On the rate of superlinear convergence of a class of variable metric methods
[AD-A070209] N79-32961
OPERATORS [MATHEMATICS]
Some relations between nonexpansive and order preserving mappings
[AD-A070202] N79-32918
Semiclosed operators in Hilbert space
N79-32964
OPERATORS [PERSONNEL]
The use of artificial signals during SONAR-watch
[IZF-1978-25] N79-32837
Identification of finite state models of human operators
[AD-A070079] N79-32897
OPTICAL ACTIVITY
Epimerization of isotactic polystyrene
N79-32354
OPTICAL COMMUNICATION
Fiber optics for tactical communications
[AD-A070274] N79-33015
Light emitting diodes for fiber optic communications
[AD-A071158] N79-33021
Low cost fiber optic cable assemblies for local distribution systems
[AD-A070723] N79-33022
OPTICAL DATA PROCESSING
Real-time nonlinear optical information processing --- using image transducers
[AD-A071541] N79-32899
Wide bandwidth liquid crystal light valve --- interface for coherent optical data processing
[AD-A070675] N79-33083
OPTICAL EQUIPMENT
Development of techniques for the design of athermalized optical systems --- for focusing and boresighting using wave theory
[AD-A070257] N79-33016
OPTICAL MEASUREMENT
A new method for the measurement of Rockwell diamond indenters
[NPL-MOM-33] N79-32557
Noise in coherent optical systems: Minimum detectable object contrast and speckle smoothing
[AD-A070040] N79-33014
OPTICAL MEASURING INSTRUMENTS
Optically isolated logarithmic nanoammeter capable of floating to 5 kilovolts
[NASA-TP-1527] N79-32467
OPTICAL PROPERTIES
Optical versus transport processes in chalcogenide glasses
[AD-A070927] N79-32360
Development of techniques for the design of athermalized optical systems --- for focusing and boresighting using wave theory
[AD-A070257] N79-33016
Advanced optical ceramics, phase 1
[AD-A070909] N79-33019
An analysis of the effects of optical aberrations on relative positions of stars in the image plane of astrometric telescopes
N79-33116
X-ray optical characteristics of a Wolter telescope
[MPI-PAE/EXTRATERR-146] N79-33123
OPTICAL RADAR
Development of tunable high pressure CO2 laser for lidar measurements of pollutants and wind velocities, January 1976 to December 1977
[NASA-CR-3175] N79-32540
OPTICAL RESONATORS
Analytic approaches to unstable resonators --- calculating the eigenvalues and eigenmodes of large Fresnel number resonators using asymptotic approaches
[AD-A071024] N79-32473
OPTICAL TRANSITION
Optical detection of spectral diffusion of the triplet state zerofield transition energy --- liquid crystals
[AD-A071179] N79-33084
OPTICAL WAVEGUIDES
Analysis of the molecular stuffing strengthening process for glass fiber optical waveguides
N79-33012
OPTICS
Precision machining versus optical process
[UCRL-82528] N79-32398
OPTIMAL CONTROL
Robust optimal systems in radar and communications
N79-32406
Optimum axial flow taper in a countercurrent gas centrifuge
[K/OA-4445] N79-32504
Performance and workload analysis of inflight helicopter missions
[NLR-MP-77013-U] N79-32834
OPTIMIZATION
Multi-element airfoil design by optimization
[NLR-TR-78135-U] N79-32181
Study on expenditure optimization for satellite and Spacelab experiments
[BMFT-FB-W-78-34] N79-32246

Automatic storage optimization --- compiler
N79-32848
PROCOPES [Conversational Program for Signal Processing]: Evolution toward an interpretative command language
[ONERA-NT-1978-8] N79-32883
Some memorable incidents in probabilistic/statistical studies
[AD-A070023] N79-32947

ORGANIC COMPOUNDS
Applications of chemical reactions to the determination of trace quantities of organic functional groups
N79-32264
Correlation and estimation of vapor-liquid critical properties. Part 2: Critical pressures and critical volumes of organic compounds
[NPL-CHEM-98] N79-32316
VOC [Volatile Organic Compounds] emissions reduction study for oxidant attainment in Massachusetts, Rhode Island, and Connecticut
[PB-294983/2] N79-32754
Summary of group I control technique guideline documents for control of volatile organic emissions from existing stationary sources
[PB-294975/8] N79-32755

ORGANIC MATERIALS
Peat gasification: An experimental study
[CONF-780611-8] N79-32391

ORIFICE FLOW
Thermal stability of natural convection in slots and flow down an inclined heated plane
N79-32497

ORTHOGONALITY
Discrete-time spectral estimation of continuous-time processes: The orthogonal series method spectral estimation by orthogonal series
[AD-A070641] N79-32952

ORTHOTROPIC PLATES
A finite element model to study the buckling behavior of general orthotropic, midplane symmetric, elastic plates
[NLR-TR-77062-U] N79-32594

OSCILLATIONS
Oscillation theory of systems of ordinary differential equations
N79-32901

OSCILLATORS
High power phase locked laser oscillators
[NASA-CR-159630] N79-32538

OSMOSIS
For today: Membrane-produced gasahol. For tomorrow: Membrane-produced alcohol
[PB-295814/8] N79-32395

OXIDATION
Passivation of the pyrotechnic fuels titanium and titanium hydride in oxidative environments
[SAND-78-0264C] N79-32378

OXIDES
Development of an industrial process for the production of indium oxide layers for the improvement of the K-values of insulating glass panes
[BMFT-FB-T-78-34] N79-32282

OXYGEN CONSUMPTION
Oxygen delivery in the hypoxic perfused heart: Relation to functional and metabolic changes
N79-32825

OXYGEN METABOLISM
Oxygen delivery in the hypoxic perfused heart: Relation to functional and metabolic changes
N79-32825

OZONE
Recent measurements of the rates of ozone removal from the atmosphere by land surfaces --- agricultural land
[CONF-780636-11] N79-32748
VOC [Volatile Organic Compounds] emissions reduction study for oxidant attainment in Massachusetts, Rhode Island, and Connecticut
[PB-294983/2] N79-32754

OZONOSPHERE
Long term effect on the ozone layer of nitrogen oxides produced by thermonuclear explosions in the atmosphere
[AERONOMICA-ACTA-A-198-1979] N79-32763

P

P-N JUNCTIONS
Modeling of thin, back-wall silicon solar cells
N79-32650
High efficiency cell geometry
N79-32653
Laser Techniques in Photovoltaic Research
N79-32655

P-N-P JUNCTIONS
PNP: planar transistor technology
[BMFT-FB-T-78-20] N79-32483

PACKING DENSITY
New functionally integrated circuits
[BMFT-FB-T-78-37] N79-32485

PANELS
Residual strength characteristics of composite reinforced stiffened panels --- load tests to failure
[NLR-TR-78025-U] N79-32290

PAPERS
Lunar studies
[NASA-CR-162318] N79-33141

PARABOLIC ANTENNAS
Metal grid angular filters for sidelobe suppression
[AD-A070111] N79-32424
A study of the scanning properties of some simple reflections
[AD-A070112] N79-32434

PARABOLIC DIFFERENTIAL EQUATIONS
Efficient higher order single step methods for parabolic problems, part 1
[AD-A070217] N79-32910

PARABOLIC REFLECTORS
Channel Islands television programme links: The design of a uhf feed antenna for a 9.14m diameter paraboidal reflector
[BBC-RD-1979/12] N79-32403

PARABOLOID MIRRORS
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 2: Technical
[HAC-REF-E3256-VOL-2] N79-32639

PARACHUTE DESCENT
Recovery systems design guide
[AD-A070251] N79-32170

PARACHUTE FABRICS
Kevlar properties investigation development of Kevlar tensile test methods
[AD-A071405] N79-32363

PARAFFINS
Screening of zeolite catalysts for methanol conversion to light hydrocarbons
[COO-4691-1] N79-32386

PARAMETERIZATION
Parametrically excited nonlinear multidegree-of-freedom systems --- the parametric excitation is harmonic
N79-32967

PARITY
Symmetry breaking in nuclei --- involving isospin and parity
N79-32993

PARSING ALGORITHMS
Locally least-cost error correctors for context-free and context-sensitive parsers
N79-32871

PARTIAL DIFFERENTIAL EQUATIONS
Semidirect methods for discretized nonlinear partial differential equations, with particular applications to fluid dynamics
[AD-A069596] N79-32514
Multidimensional quadrature formulas using partial derivates
[AD-A070582] N79-32915
Some linear differential equation problems in the analysis of dissolved species in cracks
[NPL-DNACS-14/79] N79-32927

PARTICLE ACCELERATION
Microtron injector for LEP
[TRITA-EPP-79-05] N79-33009

PARTICLE BEAMS
Sandia's particle beam fusion program
[SAND-79-0600C] N79-33005
Microtron injector for LEP
[TRITA-EPP-79-05] N79-33009

PARTICLE COLLISIONS
Inelastic electronic collision in hydrocarbons and dyes
[AD-A070172] N79-32986

PARTICLE DIFFUSION
Guide for estimating dry deposition velocities of sulfur over the eastern United States and surrounding regions
[ANL/RER-79-2] N79-32750

PARTICLE MOTION
Limiting mechanisms of dislocation motion in ice
N79-32602

PARTICLE SIZE DISTRIBUTION
Possible use of two laser beams to determine particle-size distribution
[AD-A070965] N79-32542
Calculation of forward scattered intensity from particles at optical beam propagation
[FOA-C-30164-E1] N79-33026

PARTITIONS [MATHEMATICS]
Decomposition of weighted graphs using the interchange partitioning technique
[AD-A069549] N79-32859

PASSIVITY
Technology of interfaces on silicate glass passivated semiconductor power devices
[BMFT-FB-T-78-40] N79-32486

PATENT POLICY
Published patent applications and patents resulting from German government sponsored research and development
[BMFT-FB-T-78-31] N79-33151

PATTERN RECOGNITION
Feature selection via entropy minimization: An example using LANDSAT satellite data --- forested shorelines near Lake Massaciuccole between Lucca and Pisa, Italy
[E79-10286] N79-32610
Computerized pattern recognition applied to Ni-Cd cell lifetime prediction
[AD-A070344] N79-32675
On the efficient implementation of production systems
N79-32873
Algorithms for discovering hierarchical relationships among dichotomous items
N79-32904
On-board transit origin-destination survey data: Expanding their use via on-line data access and analysis
[PB-294967/5] N79-33114

PAVEMENTS
Recycling of asphalt concrete airfield pavement: A laboratory study
[AD-A072117] N79-32218
Prevention of early pavement deterioration --- due to moisture in asphalt mixes, temperature susceptability, and transverse cracking
[PB-296337/9] N79-32402

PAYLOADS
Magnetosphere sounding rocket program. A substorm phenomena payload. Report on system design, integration, testing, and flight
[BMFT-FB-W-78-35] N79-32247

PERFORMANCE
Performance of ceramic materials in high temperature steam and hydrogen
[BNL-25812] N79-32367
Summary of GaAs Solar Cell Performance and Radiation Damage Workshop
N79-32669

PERFORMANCE PREDICTION
Computer modeling of a two-junction, monolithic cascade solar cell
N79-32672
Performance and workload analysis of inflight helicopter missions
[NLR-MP-77013-U] N79-32834
METAPHOR [version 1]: Users guide --- performability modeling
[NASA-CR-162322] N79-32877
Performability modeling with continuous accomplishment sets
[NASA-CR-162323] N79-32906
On search performance for conjunctive queries in compressed, fully transposed ordered files
[TRITA-NA-79-08] N79-33104

PERFORMANCE TESTS
Aerodynamic data for three supercritical airfoils: RAE[NPL]9515 and 9530, and RAE 9550. Parts 1 and 2
[ARC-R/M-3820] N79-32178
Trials of the Doppler microwave landing system at London [Gatwick] Airport, August 1977
[RAE-TR-78124] N79-32194
Trials of the Doppler microwave landing system at Manchester International Airport, October/November 1977
[RAE-TR-78144] N79-32195
Interim results of DABS/ATCRBS electromagnetic compatibility testing
[AD-A072087] N79-32418
Characterization of solar cells for space applications. Volume 8: Electrical characteristics of Spectrolab BSF, BSR, textured 290-micron solar cells [K7] as a function of intensity, temperature and irradiation
[NASA-CR-162290] N79-32630
Radiation damage in high-voltage silicon solar cells
N79-32658
Performance tests of the radial outflow reaction turbine for geothermal applications
[UCID-17902] N79-32693
Computer display set AN/UYQ-21 TECHEVAL test. System meets all specifications and is judged to be suitable for OPEVAL
[AD-A070260] N79-32857
Tests on a 50tera neutron generator
[BMVG-FBWT-78-14] N79-33006

PERIODIC FUNCTIONS
Qualitative analysis of the periodically forced relaxation oscillations
N79-32965

PERIODIC VARIATIONS
Radiation variability and correlation studies --- earth-atmosphere system
N79-32802

PERIODICALS
Energy information data base. Serial titles
[TID-4579-R-10-SUPPL-1] N79-32721
National Periodicals Center concept reconsidered: Alternatives and costs
[PB-296351/0] N79-33105
Journal in scientific communication: The roles of authors, publishers, libraries and readers in a vital system
[PB-296263/7] N79-33108

PERIPHERAL JET FLOW
Windtunnel measurements on the interference between a jet and a wing located outside the jet. Part 1: Text, tables, and figures
[NLR-TR-77009-U] N79-32175
PETROLEUM PRODUCTS
Role of refined product imports in the domestic fuel market
[DOE/EIA-0102/53] N79-32372
PH
Kinetics and reaction products of aerobic pyrrhotite [FeS] hydrolysis at ambient temperatures
[METC/RI-79/3] N79-32311
PHASE ERROR
On the minimization of spherical aberration in spherical reflector antennas
[NASA-TM-80140] N79-32466
PHASE LOCKED SYSTEMS
Communication application of adaptive arrays
[AD-A070181] N79-32431
Jamming signal reduction in spread spectrum systems
[AD-A069947] N79-32435
High power phase locked laser oscillators
[NASA-CR-159630] N79-32538
PHASE TRANSFORMATIONS
Phase transformations in Ti alloys: A review of recent developments
[AD-A070906] N79-32330
Allowed and forbidden transitions in metallic ferromagnetics and ferrimagnets N79-33067
Theory of phase transitions in gases adsorbed on solids N79-33072
An investigation of factors affecting the semiconductor-to-metal transition of V[1-x]W[x]O[2] N79-33076
PHASED ARRAYS
Evaluation of the JPL X-band 32 element active array --- for deep space communication
[NASA-CR-162297] N79-32409
PHOENIX [AZ]
Urbanization and its effects on the climate of Phoenix N79-32740
PHOTOABSORPTION
Inverse bremsstrahlling absorption rate in an intense laser field
[UCRL-13965] N79-32544
PHOTOCHEMICAL REACTIONS
A model for diffuse interstellar clouds: Improvements to the theory of molecular hydrogen photodestruction and to the gas phase chemistry of carbon monoxide N79-33130
PHOTOCONDUCTORS
A photoconductive detector for the middle infrared
[BMFT-FB-W-78-32] N79-32532
PHOTODIODES
The enlargement of fast avalanche photodiode bandwidths by capacitance compensation
[IPF-77-3] N79-33060
Astronomical spectroscopy through real time computer control of photodiode array detectors N79-33120
PHOTOELASTIC ANALYSIS
Photoelastic studies of advanced lap joint concept
[NASA-CR-162316] N79-32575
PHOTOGEOLOGY
Geologic application of thermal-inertia mapping from satellite --- Powder River Basin, Arizona and Wyoming
[E79-10282] N79-32607
PHOTOINTERPRETATION
Feature selection via entropy minimization: An example using LANDSAT satellite data --- forested shorelines near Lake Massaciuccole between Lucca and Pisa, Italy
[E79-10286] N79-32610
PHOTOLUMINESCENCE
Radiative transitions induced in GaAs by modest heat treatment
[AD-A071039] N79-33088
PHOTOMETRY
Models of the distribution of photometric properties of galaxies with star formation N79-33118
PHOTONS
Two-photon correlations in amplified laser light N79-32537
Coupled neutron and photon cross sections for transport calculations
[LA-7808-MS] N79-32988
Direct solution of the equation of transfer using frequency and angle-averaged photon escape probabilities
[AD-A070545] N79-33045
PHOTOVOLTAIC CELLS
Efficiency of tandem solar cell systems as function of temperature and solar energy concentration ratio N79-32671
Combined photovoltaic/thermal system studies
[SAND-78-7031] N79-32691
Field tests of photovoltaic power systems
[COO-4094-32] N79-32700
Microprocessor-controlled autonomous sun-following mount for solar photovoltaic energy planning
[COO-4094-34] N79-32702
Application and system design study for cost-effective solar photovoltaic systems at Federal installations
[HCP/M2522-01] N79-32715
Avoiding future health problems related to solar energy [photovoltaic] technology
[BNL-25935] N79-32718
PHYSICAL WORK
Technology trends and maintenance workload requirements for the A-7, F-4, and F-14 aircraft
[AD-A070036] N79-32153
PHYSIOLOGICAL EFFECTS
Effect of environmental parameters on habitat structural weight and cost N79-32228
PHYSIOLOGICAL TESTS
Effects of acute noise traumata on whole-nerve and single-unit activity
[IZF-1978-23] N79-32829
Effects of amphetamine on response selection and response execution processes in choice reaction tasks
[IZF-1978-8] N79-32839
PIERCING
A mathematical analysis of the rotary piercing process N79-32548
PIEZOELECTRIC CRYSTALS
Piezo and pyroelectric properties of electrets --- made from polymer films
[AD-A070808] N79-32475
PIEZOELECTRIC TRANSDUCERS
Highly efficient transducer arrays useful in nondestructive testing applications
[AD-A070725] N79-32562
PIEZOELECTRICITY
Plasma poling of poly [vir[illegible]oride]: Piezoand pyroelectric response
[AD-A070750] N79-32361
Fabrication of piezoelectric polymer film
[AD-A070822] N79-33090
PILOT PERFORMANCE
Pilot performance in simulated aerial refueling as a function of tanker model complexity and visual display field-of-view
[AD-A070231] N79-32832
Performance and workload analysis of inflight helicopter missions
[NLR-MP-77013-U] N79-32834
PILOT PLANTS
Fixed bed methanation processes
[FE-2240-96] N79-32382
PIONS
Meson factories --- and their applications
[LA-UR-79-1236] N79-32989
PIPE NOZZLES
Stress concentration factors in spheres with radial flush nozzles
[CRIF-MT-129] N79-32601
PIPELINING [COMPUTERS]
Analysis and design of pipelined processors N79-32846
PIPES [TUBES]
Condensation of refrigerants on vertical fluted tubes
[ORNL/TM-5848] N79-32515
PISTON ENGINES
Stirling laboratory research engine survey report
[NASA-CR-162304] N79-32636
Demonstration of a free piston Stirling engine driven linear alternator system
[COO-2764-002] N79-32713
PLANETARY EVOLUTION
The effect of solar output, infrared cooling and latitudinal heat transport on the evolution of the earth's climate
[AERONOMICA-ACTA-A-200-1979] N79-32794
Some evolution and stability trends deduced from energy and water vapor balance models
[AERONOMICA-ACTA-A-201-1979] N79-32795
PLANETARY MAGNETIC FIELDS
A catalog of low-frequency oscillations of the earth's magnetic field as observed as SMS-2 and GOES-2 during December 1977
[PB-294327/2] N79-32793
PLANTS [BOTANY]
Review of current research on hydrocarbon production by plants
[SERI/TR-33-129] N79-32374
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
[E79-10271] N79-32605
PLASMA ACCELERATORS
Tests on a 50tera neutron generator
[BMVG-FBWT-78-14] N79-33006
PLASMA CONTROL
Research report, 1977 --- laser applications N79-33059
Analytical treatment of runaway effects --- plasma devices
[IPF-77-4] N79-33061
On the scaling of magnetic plasma confinement under classical conditions
[TRITA-PFU-79-05] N79-33064
PLASMA CYLINDERS
Variational description of the positive column with two-stem ionization
[NASA-CR-162314] N79-33035
Fast magnetosonic wave spectrum in a transversely magnetized plasma cavity
[TRITA-PFU-79-06] N79-33065
PLASMA DIAGNOSTICS
Research report, 1977 --- laser applications N79-33059
Diagnosis of the jet plasma using electron cyclotron emission
[NPL-DES-53] N79-33062
PLASMA FOCUS
Ion beam production in the plasma focus device
[UCRL-81962] N79-33053
Magnetized whirls in plasma discharges
[FOA-C-20303-D9] N79-33063
PLASMA HEATING
Preliminary experiment of neutral beam injection heating in JIPP T-2 device
[IPPJ-392] N79-33027
Simulation of lower-hybrid heating in a nonuniform plasma slab
[AD-A070491] N79-33041
PLASMA JETS
Diagnosis of the jet plasma using electron cyclotron emission
[NPL-DES-53] N79-33062
Magnetized whirls in plasma discharges
[FOA-C-20303-D9] N79-33063
PLASMA OSCILLATIONS
Competition of weakly collisional and neighboring wave effects for the destruction of amplitude oscillations
[IPPJ-407] N79-33030
PLASMA PHYSICS
Initial frequency shift of large amplitude plasma wave. 2: Ion acoustic wave
[IPPJ-409] N79-33033
PLASMA RESONANCE
Fast magnetosonic wave spectrum in a transversely magnetized plasma cavity
[TRITA-PFU-79-06] N79-33065
PLASMA SHEATHS
Plasma sheath processes
[AD-A070819] N79-33044
PLASMA SLABS
Simulation of lower-hybrid heating in a nonuniform plasma slab
[AD-A070491] N79-33041
PLASMA SPRAYING
A microstructural investigation of plasma-sprayed metal and oxide coatings N79-32320
PLASMA WAVES
Initial frequency shift of large amplitude plasma wave. 2: Ion acoustic wave
[IPPJ-409] N79-33033
Studies on the interactions between electromagnetic fields and plasmas
[AD-A071017] N79-33043
PLASMA-ELECTROMAGNETIC INTERACTION
Simulation of lower-hybrid heating in a nonuniform plasma slab
[AD-A070491] N79-33041
Studies on the interactions between electromagnetic fields and plasmas
[AD-A071017] N79-33043
Microwave experimental simulation of laser plasma interactions
[UCLA-ENG-7931] N79-33051
PLASMA-PARTICLE INTERACTIONS
An electric current model of the magnetosphere
[TRITA-EPP-79-09] N79-32784
PLASMAS [PHYSICS]
Preliminary experiment of neutral beam injection heating in JIPP T-2 device
[IPPJ-392] N79-33027
Compression of toroidal plasma by imploding plasma-liner
[IPPJ-408] N79-33032
Brillouin backscatter dependence upon pulse amplitudes, timing, target material and geometry
[AD-A070300] N79-33037
Generation of a rotating liquid liner by tangential injection
[AD-A070890] N79-33038
Stability properties of a field-reversed ion layer in a background plasma
[AD-A070611] N79-33039
Axially-dependent equilibrium of an unneutralized electron beam in an axial magnetic field
[AD-A070592] N79-33040
Direct solution of the equation of transfer using frequency and angle-averaged photon escape probabilities
[AD-A070545] N79-33045

Optimization of stabilized imploding liner fusion reactors
[AD-A070889] N79-33046
Long-pulse laser-plasma interactions at 10 to the 12th power-10 to the 15th power W/cm squared
[AD-A070462] N79-33047
An MHD instability primer
[AD-A071099] N79-33048
Some properties of the reverse-field Z-pinch: An overview
[LA-7798-MS] N79-33050
Research report, 1977 --- laser applications
N79-33059

PLASTIC COATINGS
Feasibility study of silicon nitride protection of plastic encapsulated semiconductors
[NASA-CR-161302] N79-32266

PLASTIC DEFORMATION
An application of the theory of materials with variable bonding to solid propellant
[AD-A070188] N79-32370
The solution of the axisymmetric elastic-plastic torsion of a shaft using variational inequalities
[AD-A070207] N79-32583

PLASTIC PROPERTIES
Plasticity of composite laminates
N79-32269

PLATE THEORY
Effect of deep wedge-shaped notches of small flank angle on plastic failure
[OUEL-1282/79] N79-32598

PLATES [STRUCTURAL MEMBERS]
Sixth order analyses of closure in a cracked-elastic-plastic plate
[AD-A070466] N79-32586

PLUTO [PLANET]
The visual and near infrared spectrum of methane and its application to Uranus, Neptune, Triton and Pluto
N79-33119

PNEUMATIC CONTROL
Pneumatic atomization of viscoelastic fluids
N79-32493

POINTING CONTROL SYSTEMS
A preliminary assessment of small steam Rankine and Brayton point-focusing solar modules
[NASA-CR-162302] N79-32632
Control system designs for the shuttle infrared telescope facility
[NASA-CR-162321] N79-33121

POISSON DENSITY FUNCTIONS
A comparison of sampling plans for Bayesian estimation of a Poisson process rate
[AD-A070215] N79-32948

POLAR REGIONS
The relationship between ionospheric and field aligned currents in the dayside cusp
[DMI-GEOPHYS-PAPERS-R-53] N79-32785

POLARIMETERS
Polarization transfer in inelastic proton scattering --- using polarimeter technique and spin-flip probability
N79-32992

POLARIZATION
Ferroelectric polarization in polymers
[AD-A070768] N79-32362

POLARIZATION [CHARGE SEPARATION]
Plasma poling of poly [vinylidene fluoride]: Piezoand pyroelectric response
[AD-A070750] N79-32361

POLARIZATION [WAVES]
Bistatic scattering reflection asymmetry and polarization reversal symmetry
[AD-A071008] N79-32426
Polarization transfer in inelastic proton scattering --- using polarimeter technique and spin-flip probability
N79-32992

POLARIZATION CHARACTERISTICS
The relationship between ionospheric and field aligned currents in the dayside cusp
[DMI-GEOPHYS-PAPERS-R-53] N79-32785
Polarization transfer in inelastic proton scattering --- using polarimeter technique and spin-flip probability
N79-32992

POLICE
Technical assistance for law-enforcement communications: Case study report two
[NASA-CR-162294] N79-32410
Technical assistance for law-enforcement communications: Grant summary
[NASA-CR-162305] N79-32411

POLICIES
Summary of national and international radioactive waste management programs
[PNL-2941] N79-32995

POLLUTION
VOC [Volatile Organic Compounds] emissions reduction study for oxidant attainment in Massachusetts, Rhode Island, and Connecticut
[PB-294983/2] N79-32754

POLLUTION CONTROL
Engineering study of the flue gas desulfurization unit for the power plant Weiher 3
[BMFT-FB-T-78-28] N79-32751
Summary of group 1 control technique guideline documents for control of volatile organic emissions from existing stationary sources
[PB-294975/8] N79-32755
Assessment of surface runoff from iron and steel mills
[PB-294981/6] N79-32756

POLLUTION MONITORING
Development of tunable high pressure CO2 laser for lidar measurements of pollutants and wind velocities, January 1976 to December 1977
[NASA-CR-3175] N79-32540
Satellite monitoring of sea surface pollution --- North Sea
[E79-10287] N79-32611
Assessment of surface runoff from iron and steel mills
[PB-294981/6] N79-32756

POLYAMIDE RESINS
Kevlar properties investigation development of Kevlar tensile test methods
[AD-A071405] N79-32363

POLYATOMIC MOLECULES
Investigation of electron attachment in polyatomic molecules --- sulfur hexafluoride, molybdenum hexafluoride, and tungsten oxide vapor
[AD-A070069] N79-32985

POLYETHYLENE TEREPHTHALATE
A rheo-optical study of the stress-induced crystallization of poly[ethylene terephthalate]
N79-32353

POLYETHYLENES
A study of wire coating extrusion
N79-32396

POLYHEDRONS
On the complexity of d-dimensional Voronoi diagrams
[AD-A070098] N79-32912

POLYIMIDES
Elevated-temperature application of the IITRI compression test fixture for graphite/polyimide filamentary composites
[NASA-TP-1496] N79-32277

POLYMER CHEMISTRY
Lunar building materials: Some considerations on the use of inorganic polymers --- adhesives, coatings, and binders
N79-32238

POLYMERIC FILMS
Fourier transform infrared analysis of plasma polymerized 2-vinylpyridine thin films
[SAND-78-0761C] N79-32366
Piezo and pyroelectric properties of electrets --- made from polymer films
[AD-A070808] N79-32475
Fabrication of piezoelectric polymer film
[AD-A070822] N79-33090

POLYMERS
Column chromatography of polymer latexes
N79-32352
Micellar/polymer floods for enhanced oil recovery: A review of displacement mechanisms and their simulation
[ANL/ES-74] N79-32620

POLYSTYRENE
Epimerization of isotactic polystyrene
N79-32354

POLYTOPES
On the complexity of d-dimensional Voronoi diagrams
[AD-A070098] N79-32912

PONDS
Evaluation of a large nonconvective solar pond
[MLM-2606[OP]] N79-32680

POROSITY
Description of the 3-dimensional 2-phase simulator SHAFT78 for use in geothermal reservoir studies --- mass and energy balance for two phase flow in porous media
[LBL-8802] N79-32684

POROUS BOUNDARY LAYER CONTROL
Transient flow of non-Newtonian power-law fluids in porous media
[SAN-1265-9] N79-32516

POROUS MATERIALS
Shear wave propagation in unconsolidated fluid saturated porous media
N79-32490

PORTABLE LIFE SUPPORT SYSTEMS
Microbiological evaluation of the mobile biological isolator system
[NASA-CR-162293] N79-32822

POSITRON ANNIHILATION
Electrons and kaons in charmed particle decays --- produced in electron-positron annihilation
[LBL-9017] N79-33003

POTENTIAL FIELDS
Pseudopotential methods in the calculation of electronic properties and quadrupole interactions in metals
N79-33074

POTENTIAL FLOW
Multi-element airfoil viscous-inviscid interactions
[NASA-CR-159125] N79-32157
Transonic wing redesign using a generalized fictitious gas method
[AD-A070013] N79-32202

POWDER METALLURGY
Role of deformation processing on the fatigue behavior of a high strength powder metallurgy aluminum alloy
N79-32318
Machining powder metallurgy materials
[AD-A070913] N79-32336

POWER CONDITIONING
A preliminary assessment of small steam Rankine and Brayton point-focusing solar modules
[NASA-CR-162302] N79-32632

POWER EFFICIENCY
CO2 laser annealing of 50-microns-thick silicon solar cells
N79-32659
Fabrication of high efficiency and radiation resistant GaAs solar cells
N79-32664

POWER LINES
Thermoelastic analysis of a superconducting cable
[LA-7465-MS] N79-32477

POWER SPECTRA
Image restoration by short space spectral subtraction
[AD-A070382] N79-33013

POWERED LIFT AIRCRAFT
Powered-lift aircraft handling qualities in the presence of naturally-occurring and computer-generated atmospheric disturbances
[AD-A072118] N79-32198

PRECIPITATION [METEOROLOGY]
A millimeter wave attenuation and depolarization experiment using the COMSTAR and CTS satellites
[NASA-CR-162315] N79-32442
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
Infinite cloud model of electrification by the precipitation mechanism in the presence of high rates of ion generation
[UCRL-13860] N79-32774

PREDICTION ANALYSIS TECHNIQUES
Quantitative models of hydrogen induced cracking in high strength steel
[NLR-MP-78018-U] N79-32346
Modification of NMC analyses and prognoses for use in statistical tropical cyclone prediction models
[PB-297190/1] N79-32814
The role of structure in determining the thermodynamic properties of homogeneous fluid mixtures --- using radial and probability distribution functions
N79-33094
Models of the distribution of photometric properties of galaxies with star formation
N79-33118

PRESIDENTIAL REPORTS
Aeronautics and space report of the President, 1978 activities
N79-33115

PRESSURE CHAMBERS
Safety shield for vacuum/pressure chamber viewing port
[NASA-CASE-GSC-12513-1] N79-32217

PRESSURE GRADIENTS
Pressure gradient effects on supersonic boundary layer turbulence --- wind tunnel test
[AD-A070254] N79-32167

PRESSURE MEASUREMENTS
Measured blockage effects on bluff bodies in closed and open wind tunnels
[RAE-TR-78151] N79-32182
A review of the fundamental methods used for measuring gage pressures up to kPa
[NPL-MOM-34] N79-32533

PRESSURE SUITS
Microbiological evaluation of the mobile biological isolator system
[NASA-CR-162293] N79-32822

PRESSURE VESSELS
Acoustic emission behavior of a low alloy steel --- pressure vessels
[AD-A069965] N79-32339
Torsion tests on steels used in the manufacture of high pressure vessels
[NPL-CHEM-97] N79-32349
Numerical analysis of pressure vessels using various shell theories
[IIT-B/CE-79-1] N79-32576
Numerical analysis of pressure vessels using various shell theories: Introduction
N79-32577
A critical review of relevant literature --- relating to stress analysis of pressure vessels
N79-32578
Numerical analysis --- analysis methods for pressure vessesl
N79-32580
Numerical results --- analysis of pressure vessels using various shell theories
N79-32581

Numerical analysis of pressure vessels using various shell theories: Discussions and conclusions
N79-32582
Stress analysis of cylindrical pressure vessels with closely spaced nozzles by the finite-element method. Volume 2: Vessels with two nozzles under external force and moment loadings
[NUREG-CR-0132] N79-32590
Prestressed concrete pressure vessels: Conceptual design/economic, executive summary
[FE-1775-19] N79-32591
Structural model testing for prestressed concrete pressure vessels: A study of grouted vs nongrouted posttensioned prestressing tendon systems
[ORNL/TM-6478] N79-32592

PRIMARY COSMIC RAYS
The cosmic ray boron and carbon isotopic composition measured in nuclear emulsions
[LUIP-7906] N79-33149

PROBABILITY DENSITY FUNCTIONS
Feature selection via entropy minimization: An example using LANDSAT satellite data --- forested shorelines near Lake Massaciuccoie between Lucca and Pisa, Italy
[E79-10286] N79-32610
Swedish earthquakes and acceleration probabilities
[FOA-C-20295-E4] N79-32782
Some memorable incidents in probabilistic/statistical studies
[AD-A070023] N79-32947
Estimation of the operating characteristics of item response categories. 7: Bivariate P.D.F. approach with normal approach with normal approach method
[AD-A070130] N79-32950
Direct solution of the equation of transfer using frequency and angle-averaged photon escape probabilities
[AD-A070545] N79-33045

PROBABILITY DISTRIBUTION FUNCTIONS
On sums of gamma order statistics with application to the distribution of R squared in best subset multiple regression
[AD-A070025] N79-32949
The role of structure in determining the thermodynamic properties of homogeneous fluid mixtures --- using radial and probability distribution functions
N79-33094

PROBABILITY THEORY
On recurrence of a random walk in the plane
[CTH-MATH-1979-4] N79-32932
Polarization transfer in inelastic proton scattering --- using polarimeter technique and spin-flip probability
N79-32992

PROBLEM SOLVING
Time-dependent FEM solution of the incompressible Navier-Stokes equations in two and three-dimensions
[UCRL-81323] N79-32517
Problem formulation --- governing equations for the behavior of general shell forms
N79-32579
Some problems of validation and testing of numerical air pollution models
[COO-2474-41] N79-32749
Groups with solvable word problems
N79-32868
Dependency networks as a representation for modelling in general problem solvers
N79-32889
Searching for solutions of finite nonlinear systems: An interval approach
N79-32903
The AQ algorithm for the solution of a sparse system of linear equations
[NPL-DNACS-17/79] N79-32928
A class of finite element methods for advection-diffusion problems with small diffusion
[CTH-79.01-R] N79-32929

PROCEDURES
Comparison of some methods for measuring speech levels
[IZF-1978-22] N79-32976

PROCESS CONTROL [INDUSTRY]
Precision machining versus optical process
[UCRL-82528] N79-32398

PRODUCTION ENGINEERING
Recent developments in coal liquefaction in the United States --- conferences
[CONF-790213-5] N79-32383
Fabrication of high efficiency and radiation resistant GaAs solar cells
N79-32664
Energy and cost calculations. 1: Optimization of electrochemical processes to achieve minimum product cost and the impact on energy consumption
[ANL/OEPM-78-2] N79-32697
Production of high-energy chemicals using solar energy heat
[ORNL/SUB-7390/1] N79-32707

PRODUCTION MANAGEMENT
On the efficient implementation of production systems
N79-32873

PROGRAM VERIFICATION [COMPUTERS]
A program verifier and proof of the correctness of a flight director program
N79-32864

PROGRAMMING LANGUAGES
Definition and use of attribute reevaluation in attributed grammars
N79-32863
The design and implementation of a goal-directed programming language
N79-32866
Software design and documentation language, revision 1
[NASA-CR-162291] N79-32875
Distributed computer systems: Structure and semantics
[AD-A070286] N79-32879
PROCOPES [Conversational Program for Signal Processing]: Evolution toward an interpretative command language
[ONERA-NT-1978-8] N79-32883

PROJECT MANAGEMENT
Technical assistance for law-enforcement communications: Grant summary
[NASA-CR-162305] N79-32411
Strategic petroleum reserve
[DOE/TIC-10107] N79-32617
Summary of national and international radioactive waste management programs
[PNL-2941] N79-32995
Nevada nuclear waste storage investigations
[NVO-196-9] N79-32997

PROJECT PLANNING
Environmental development plan, fossil fuel utilization program
[DOE/EDP-0046] N79-32746
The multinational F-16 aircraft program: Its progress and concern
[PB-296999/6] N79-33098

PROJECTILES
Seismic determination of impact times of supersonic projectiles
[SAND-78-1077] N79-32775

PROJECTORS
Design of IRSS projectors
[AD-A070898] N79-33020

PROPAGATION MODES
The wave structures of the Eady model of baroclinic instability
[NASA-TP-1548] N79-32796

PROPELLERS
Acoustic analysis of the propfan
[NASA-CR-162312] N79-32210

PROPULSION SYSTEM CONFIGURATIONS
Tunnel 16T performance: Two-and three-stage compressor performance
[AD-A070191] N79-32221

PROPULSION SYSTEM PERFORMANCE
Aspects of the performance of chemical rocket thrust systems
[TUM-LRT-RT-TB-78/3] N79-32263

PROTECTIVE COATINGS
Feasibility study of silicon nitride protection of plastic encapsulated semiconductors
[NASA-CR-161302] N79-32266
A microstructural investigation of plasma-sprayed metal and oxide coatings
N79-32320

PROTON FLUX DENSITY
Solar MeV protons recorded during experiment S 99 on board ESRO-4 in 1973
[ESA-STR-203] N79-33144

PROTON IRRADIATION
Radiation damage in GaAs solar cells
N79-32663

PROTON SCATTERING
Polarization transfer in inelastic proton scattering --- using polarimeter technique and spin-flip probability
N79-32992

PROTONS
Meson factories --- and their applications
[LA-UR-79-1236] N79-32989
Stability properties of a field-reversed ion layer in a background plasma
[AD-A070611] N79-33039

PSYCHOLOGICAL TESTS
Shalit Perceptual Organization and Reduction Questionnaire [SPORQ]. Report 2: Characteristics and reliability
[FOA-C-55031-H6] N79-32836

PSYCHOLOGY
Algebraic systems: Applications in the behavioral and social sciences
[AD-A070103] N79-32966

PUBLIC LAW
Impacts of the Resource Conservation and Recovery Act on the siting of coal-conversion energy facilities in the United States
[ORNL/OEPA-12] N79-32724

PULSE CODE MODULATION
PCM techniques aid in storing analog data: An exact magnetic-tape storage method for analog measurement signals
[ORNL/TR-4573] N79-32529

PULSE COMMUNICATION
An 800 MHz communications survey of the Los Angeles area
[PB-295043/4] N79-32456

PULSED LASERS
Development of tunable high pressure CO2 laser for lidar measurements of pollutants and wind velocities, January 1976 to December 1977
[NASA-CR-3175] N79-32540
New materials properties achievable by ion implantation doping and laser processing --- for crystal regrowth by ion scattering
[CONF-781121-22] N79-33093

PULSED RADIATION
Extension of the heat pulse technique to the minute heat capacities of thin films at low temperatures
N79-32491
High current pulsed linear ion accelerators for inertial fusion applications
[SAND-78-0778C] N79-33056

PYRIDINES
Fourier transform infrared analysis of plasma polymerized 2-vinylpyridine thin films
[SAND-78-0761C] N79-32366

PYROELECTRICITY
Plasma poling of poly [vinylidene fluoride]: Piezoand pyroelectric response
[AD-A070750] N79-32361
Piezo and pyroelectric properties of electrets --- made from polymer films
[AD-A070808] N79-32475
Fabrication of piezoelectric polymer film
[AD-A070822] N79-33090

PYROHELIOMETERS
Microprocessor-controlled autonomous sun-following mount for solar photovoltaic energy planning
[COO-4094-34] N79-32702

PYROLYSIS
Mathematical model of forward combustion retorting of oil shale
[LETC/TPR-78/1] N79-32375

PYROTECHNICS
Passivation of the pyrotechnic fuels titanium and titanium hydride in oxidative environments
[SAND-78-0264C] N79-32378
Experimental determination of the equation of state of explosives and pyrotechnics used in explosive actuators
[SAND-78-8628] N79-32392

PYRRHOTITE
Kinetics and reaction products of aerobic pyrrhotite [FeS] hydrolysis at ambient temperatures
[METC/RI-79/3] N79-32311

Q

QUADRUPOLES
Pseudopotential methods in the calculation of electronic properties and quadrupole interactions in metals
N79-33074

QUALITATIVE ANALYSIS
A physical method for measuring speech-transmission quality
[IZF-1979-1] N79-32451

QUALITY CONTROL
Aviation turbine fuels, 1978 --- thermophysical properties
[BETC/PPS-79/2] N79-32381
Application of Bayesian techniques to reliability demonstration, estimation and updating of the prior distribution
[AD-A070236] N79-32559
Computer performance measurement tools and techniques
N79-32849

QUANTITATIVE ANALYSIS
Molecular structure and cohesive properties of polymeric adhesives
[AD-A069517] N79-32365
Applications of the modulation transfer function in room acoustics
[IZF-1978-19] N79-32975

QUASARS
An annihilation model of the QSO's
[TRITA-EPP-79-08] N79-33134

QUEUEING THEORY
Comparison of some methods to determine the delays of landing aircraft with respect to runway capacity
[NLR-MP-77028-U] N79-32191
An analysis approach to diffusion approximations in queueing
N79-32892
A contribution to diffusion theory with applications
N79-32893
Heavy traffic results for single server queues with dependent EARMA service and interarrival times
[AD-A070086] N79-32895
Queues and stores with nonhomogeneous input
[AD-A069550] N79-32900

R

RADAR
Robust optimal systems in radar and communications
N79-32406
Bistatic scattering reflection asymmetry and polarization reversal symmetry
[AD-A071008] N79-32426
RADAR APPROACH CONTROL
Interim results of DABS/ATCRBS electromagnetic compatibility testing
[AD-A072087] N79-32418
RADAR CROSS SECTIONS
Measurements of bistatic clutter cross section
[AD-A071193] N79-32428
RADAR IMAGERY
Numerical studies of conversion and transformation in a surveillance system employing a multitude of radars, part 2 --- advanced air traffic control services
[AD-A072086] N79-32415
RADAR NAVIGATION
Prediction of transionospheric signal time delays at widely separated locations using correlative techniques
[AD-A070538] N79-32187
RADAR TRACKING
Correlation techniques for deep space uncorrelated targets
[AD-A071014] N79-32425
Distributed sensor networks
[AD-A070455] N79-32438
RADIAL DISTRIBUTION
The role of structure in determining the thermodynamic properties of homogeneous fluid mixtures --- using radial and probability distribution functions
N79-33094
RADIANCE
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609
RADIATION ABSORPTION
A millimeter wave attenuation and depolarization experiment using the COMSTAR and CTS satellites
[NASA-CR-162315] N79-32442
RADIATION DAMAGE
Estimates of maximum electric field strengths in the automobile environment
[PB-294819/8] N79-32453
Electron irradiation of tandem junction solar cells
N79-32657
Radiation damage in high-voltage silicon solar cells
N79-32658
High-energy electron-induced damage production at room temperature in aluminum-doped silicon
N79-32662
Radiation damage in GaAs solar cells
N79-32663
Summary of GaAs Solar Cell Performance and Radiation Damage Workshop
N79-32669
Application of ion channeling to radiation damage studies --- for depth profiling of intrinsic defects in metals
[SAND-79-0497C] N79-32990
Materials considerations for Inertially-Confined Fusion Reactors [ICFR]
[UCRL-81206] N79-33049
RADIATION EFFECTS
Standard procedure for use of thermoluminescence dosimetry in radiation-hardness testing of electronic devices
[AD-A071172] N79-32474
Radiation damage of laser materials. A bibliography with abstracts
[NTIS/PS-79/0514/4] N79-32547
Langley program of GaAs solar cells --- emphasizing energy conversion efficiency and radiation resistance
N79-32644
Radiation effects in GaAs AMOS solar cells
N79-32667
Materials considerations for Inertially-Confined Fusion Reactors [ICFR]
[UCRL-81206] N79-33049
RADIATION HARDENING
Solar photovoltaic research and development program of the Air Force Aero Propulsion Laboratory --- silicon solar cell applicable to satellite power systems
N79-32642
RADIATION MEASUREMENT
Heliostat beam characterization system
[SAND-79-0697C] N79-32703
Earth Radiation Budget Science, 1978 --- conferences
[NASA-CP-2100] N79-32797
Earth Radiation Budget Science, 1978. 1: Introduction --- to obtain radiation budget measurements by satellite observation
N79-32798
Radiation budget and related measurements in 1985 and beyond --- earth radiation budget satellite system
N79-32804
Review of unfolding methods used in the US and their standardization for dosimetry
[BNWL-SA-6503] N79-32828
RADIATION MEASURING INSTRUMENTS
Radiation budget and related measurements in 1985 and beyond --- earth radiation budget satellite system
N79-32804
RADIATION PRESSURE
Multiple attitude maneuvers for a spinning spacecraft disturbed by solar radiation
[NLR-TR-78078-U] N79-32260
RADIATION SOURCES
Source radiation in the presence of convex bodies
[AD-A070827] N79-32440
RADIATION SPECTRA
Review of unfolding methods used in the US and their standardization for dosimetry
[BNWL-SA-6503] N79-32828
RADIATION THERAPY
Meson factories --- and their applications
[LA-UR-79-1236] N79-32989
RADIATION TOLERANCE
Solar Cell High Efficiency and Radiation Damage, 1979
[NASA-CP-2097] N79-32640
Applications of ion implantation to high performance, radiation tolerant silicon solar cells
N79-32648
Fabrication of high efficiency and radiation resistant GaAs solar cells
N79-32664
RADIATIVE HEAT TRANSFER
Earth Radiation Budget Science, 1978 --- conferences
[NASA-CP-2100] N79-32797
Climate diagnostics --- using radiation and meteorological data for diagnosing climatic fluctuations
N79-32800
RADIATIVE TRANSFER
A computer method for calculating the radiative interchange factors in a complex enclosure and an extension of the method to the calculation of the incident flux distribution
[CNES-NT-89] N79-32520
Direct solution of the equation of transfer using frequency and angle-averaged photon escape probabilities
[AD-A070545] N79-33045
RADIO ANTENNAS
Design study of a low profile, high frequency antenna system
[AD-A070091] N79-32436
RADIO ASTRONOMY
Radio recombination line observations of the ionized gas in the Galactic Center
N79-33125
On the structures of HII regions and their distribution in the galaxy
N79-33131
RADIO COMMUNICATION
Modelling and system identification for the inphase/quadrature process
N79-32407
The radio spectrum international allocation and regulation
[AD-A070110] N79-32437
An 800 MHz communications survey of the Los Angeles area
[PB-295043/4] N79-32456
Microwave applications processing system: A user's guide
[PB-294692/9] N79-32458
Planetary data system requirements: Multi-mission radio science requirements for the 1978 to 1988 era
[NASA-CR-162306] N79-33139
RADIO EQUIPMENT
Command and control related computer technology: Packet radio
[AD-A070447] N79-32430
Design study of a low profile, high frequency antenna system
[AD-A070091] N79-32436
RADIO FREQUENCY INTERFERENCE
Modelling and system identification for the inphase/quadrature process
N79-32407
RADIO NAVIGATION
Prediction of transionospheric signal time delays at widely separated locations using correlative techniques
[AD-A070538] N79-32187
RADIO RECEIVERS
The 3 kHz SQUID receiver development
[AD-A069709] N79-32429
RADIO RELAY SYSTEMS
Biomedical communications experiments using the communications technology satellite: Executive summary
[PB-294405/6] N79-32459
RADIO SIGNALS
Baseband signal combiner for antenna array
[NASA-CASE-NPO-14641-1] N79-32408
The radio spectrum international allocation and regulation
[AD-A070110] N79-32437
RADIOACTIVE DECAY
Electrons and kaons in charmed particle decays --- produced in electron-positron annihilation
[LBL-9017] N79-33003
RADIOACTIVE ISOTOPES
Radioisotope production with electron accelerators
[REPT-78/5] N79-33007
RADIOACTIVE MATERIALS
Experience with installation and operation of digital electronic balances --- conferences
[LA-UR-79-1029] N79-32530
RADIOACTIVE WASTES
Summary of national and international radioactive waste management programs
[PNL-2941] N79-32995
Nevada nuclear waste storage investigations
[NVO-196-9] N79-32997
Early screening of nuclear waste retrieval and processing alternatives
[LA-UR-78-2412] N79-32998
Management of radioactive fuel wastes: The Canadian disposal program
[AECL-6314] N79-33000
Risk assessment for radioactive waste disposal
[AECL-6322] N79-33001
A survey of the available methods of solidification for radioactive wastes
[PB-295214/1] N79-33010
A survey of packaging for solidified low-level radioactive waste --- studying containers for underground storage
[PB-295038/4] N79-33011
RADOME MATERIALS
Advanced optical ceramics, phase 1
[AD-A070909] N79-33019
RAIN
Interduration precipitation relations for storms: Southeast states
[PB-297192/7] N79-32815
RAIN FORESTS
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
[E79-10271] N79-32605
RAINSTORMS
Interduration precipitation relations for storms: Southeast states
[PB-297192/7] N79-32815
RAMJET ENGINES
Liquid fuel jet injection into a simulated subsonic dump combustor
[AD-A071028] N79-32509
RANDOM NOISE
Asymptotically optimum zero memory detectors for dependent noise process
[AD-A069982] N79-32433
RANDOM PROCESSES
On coupling of continuous time renewal processes
[CTH-MATH-1979-11] N79-32937
RANDOM VARIABLES
Heavy traffic results for single server queues with dependent EARMA service and interarrival times
[AD-A070086] N79-32895
Robust detectors based on the occupancy vector
N79-32905
A stagewise directional test based on T statistics
[CTH-MATH-1979-3] N79-32957
RANDOM WALK
On recurrence of a random walk in the plane
[CTH-MATH-1979-4] N79-32932
A self-avoiding random walk --- on the integer lattice for three or more dimensions
N79-32962
RANGELANDS
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions --- Rio Grande Valley, Texas
[E79-10280] N79-32606
RARE EARTH COMPOUNDS
Experimental studies of valence instabilities
[AD-A070352] N79-32306
Stability of the lanthanide hydrides
[LA-7602-MS] N79-32991
RARE GASES
The formation of reactive intermediates in rare-gas matrices and a study of the interactions involved in proton rare-gas clusters
N79-32982
Studies of noble gases in meteorites and in the earth
N79-33135
RATES [PER TIME]
Estimation of rate constants in the Michaelis-Menten model
[AD-A070360] N79-32824
RATIONAL FUNCTIONS
Approximation of e exponent -x by rational functions with concentrated negative poles
[CTH-MATH-1979-9] N79-32936
RAYLEIGH-RITZ METHOD
Variational description of the positive column with two-stem ionization
[NASA-CR-162314] N79-33035

REACTION KINETICS
Kinetics of the displacement reaction between Fe and Cu2O at temperatures between 800 and 1050 degrees C
[AD-A070664] N79-32308
Kinetics and reaction products of aerobic pyrrhotite [FeS] hydrolysis at ambient temperatures
[METC/RI-79/3] N79-32311
Reduction of nitric oxide by carbon monoxide over a silica supported platinum catalyst: Infrared and kinetic studies
[LBL-8007] N79-32312
Estimation of rate constants in the Michaelis-Menten model
[AD-A070360] N79-32824
Kinetic models for irreversible processes on a lattice
[IS-T-850] N79-33092

REACTOR DESIGN
Electromagnetic field and mechanical stress analysis code. Appendix A: Preliminary conceptual design study of the riggatron approach to fusion power
[DOE/TIC-4068-T2-APP-A] N79-32443
Definition and conceptual design of a small fusion reactor
[EPRI-ER-1045] N79-33004

REACTOR MATERIALS
Materials considerations for Inertially-Confined Fusion Reactors [ICFR]
[UCRL-81206] N79-33049
Hydrogen retention and release in first-wall coatings for Tokamaks
[SAND-78-2128C] N79-33055
Damage of metal surfaces by a hot dense deuterium plasma --- using unipolar arcing for the study of fusion reactor materials
[COO-4393-03] N79-33057

REACTOR PHYSICS
Sandia's particle beam fusion program
[SAND-79-0600C] N79-33005
Generation of a rotating liquid liner by tangential injection
[AD-A070690] N79-33038
Optimization of stabilized imploding liner fusion reactors
[AD-A070889] N79-33046

REAL TIME OPERATION
Survey and evaluation of potential real-time interactive flight test facilities for the B-1
[AD-A070343] N79-32222
Software reliability determination and prediction
[AD-A069976] N79-32880
Computational structures for extracting edge features from digital images for real-time control applications
N79-32894
Real-time nonlinear optical information processing --- using image transducers
[AD-A071541] N79-32899
Astronomical spectroscopy through real time computer control of photodiode array detectors
N79-33120

RECEIVERS
Thermal energy storage for advanced solar central receiver power systems
[SAND-78-8221] N79-32694

RECORDING INSTRUMENTS
A multichannel digital sound recorder
[BBC-RD-1979/15] N79-32524

RECOVERY PARACHUTES
Recovery systems design guide
[AD-A070251] N79-32170

RECYCLING
Recycling of asphalt concrete airfield pavement: A laboratory study
[AD-A072117] N79-32218

REDUCED GRAVITY
Feasibility study of liquid pool burning in reduced gravity
[NASA-CR-159642] N79-32303

REDUCTION [CHEMISTRY]
Extraction processes for the production of aluminum, titanium, iron, magnesium, and oxygen and nonterrestrial sources
N79-32240
Reduction of nitric oxide by carbon monoxide over a silica supported platinum catalyst: Infrared and kinetic studies
[LBL-8007] N79-32312
The effect of a magnesium oxide additive on the reduction of iron oxides
[TKK-V-A3[1978]] N79-32343
A study of homogeneous reduction of carbon monoxide to hydrocarbons and methanol
N79-32368

REFLECTORS
A study of the scanning properties of some simple reflectors
[AD-A070112] N79-32434
On the minimization of spherical aberration in spherical reflector antennas
[NASA-TM-80140] N79-32466

REFRACTORIES
Combustion of uniformly sized droplet sprays in a refractory tube
N79-32299

REFRIGERANTS
Condensation of refrigerants on vertical fluted tubes
[ORNL/TM-5848] N79-32515

REGENERATION [ENGINEERING]
Research planning criteria for regenerative life-support systems applicable to space habitats
N79-32227

REGRESSION ANALYSIS
A Bayesian approach to random coefficient models --- using linear regression models
N79-32944
On sums of gamma order statistics with application to the distribution of R squared in best subset multiple regression
[AD-A070025] N79-32949
A stagewise directional test based on T statistics
[CTH-MATH-1979-3] N79-32957

REINFORCEMENT [STRUCTURES]
Structural optimization of sheet molding compound line focusing collectors
[SAND-79-0215C] N79-32710

REINFORCING FIBERS
Thermorheological effects on fatigue life of fiber composites
N79-32272
Mathematical modeling and micromechanics of fiber-reinforced bimodulus composite materials
[AD-A071389] N79-32278
Residual strength characteristics of composite reinforced stiffened panels --- load tests to failure
[NLR-TR-78025-U] N79-32290

RELAXATION METHOD [MATHEMATICS]
Qualitative analysis of the periodically forced relaxation oscillations
N79-32965

RELAXATION OSCILLATORS
Qualitative analysis of the periodically forced relaxation oscillations
N79-32965

RELIABILITY ANALYSIS
Reliability analysis and optimum maintenance scheduling of molded-case circuit breakers
N79-32461
Theoretical and computational aspects of reliability indices for large scale systems
N79-32558
Phased models for evaluating the performability of computing systems
[NASA-CR-162317] N79-32876
METAPHOR [version 1]: Users guide --- performability modeling
[NASA-CR-162322] N79-32877
Performability modeling with continuous accomplishment sets
[NASA-CR-162323] N79-32906

RELIABILITY ENGINEERING
Meteorological rocket network system reliability
[AD-A070187] N79-32808

REMOTE HANDLING
Experience with installation and operation of digital electronic balances --- conferences
[LA-UR-79-1029] N79-32530

REMOTE SENSORS
Basic remote sensing investigation for coastal reconnaissance
[AD-A070770] N79-32615
Advanced training and research on satellite remote sensing techniques and applications in the United Kingdom and the United States, 1 October 1977 to 30 September 1978
[AGLT/RSU-SERIES-2/79] N79-32622
US Geological Survey sources of photographs and images of biosphere reserves taken from spacecraft and aircraft: Everglades National Park
[PB-296353/6] N79-32624

REPETITION
On coupling of continuous time renewal processes
[CTH-MATH-1979-11] N79-32937

REPORTS
Transportation systems center bibliography of technical reports
[PB-296342/9] N79-33107

REQUIREMENTS
Habitat and logistic support requirements for the initiation of a space manufacturing enterprise
N79-32229
Archival storage requirements
[UCRL-82513] N79-33103
Planetary data system requirements: Multi-mission radio science requirements for the 1978 to 1988 era
[NASA-CR-162306] N79-33139

RESEARCH
Lunar studies
[NASA-CR-162318] N79-33141

RESEARCH AND DEVELOPMENT
Activities of the Division of Quantum Metrology
[NPL-QU-AR-77] N79-32400
Activities of the Division of Quantum Metrology
[NPL-QU-AR-78] N79-32401
Nuclear safeguards research and development
[LA-7616-PR] N79-32996
Published patent applications and patents resulting from German government sponsored research and development
[BMFT-FB-T-78-31] N79-33151

RESEARCH MANAGEMENT
Research planning criteria for regenerative life-support systems applicable to space habitats
N79-32227
Solar thermal test facilities users association
[SERI/PR-13-154] N79-32688

RESERVES
Strategic petroleum reserve
[DOE/TIC-10107] N79-32617
Reexamination of the estimation of undiscovered oil resources in the US
[DOE/EIA-0103/31] N79-32618

RESIDUAL STRESS
Residual stresses in ground steels
[AD-A070798] N79-32584
X-ray diffraction measurements of crack tip stresses as a crack advances through a single overload affected zone
[AD-A070193] N79-32588

RESONANCE PROBES
Theoretical investigations of experimental gravitation --- outlining applications of resonant sensing systems to gravitational wave astronomy
N79-32761

RESONANT FREQUENCIES
Frequency analysis of a thick-rim flywheel
[ORNL/TM-5804] N79-32555

RESPONSES
Effects of amphetamine on response selection and response execution processes in choice reaction tasks
[IZF-1978-8] N79-32839

RESTORATION
Image restoration by short space spectral subtraction
[AD-A070382] N79-33013

RETENTION [PSYCHOLOGY]
A comparison of verbal and visual imagery learning stategies: Their importance for instrumental technology
[AD-A069983] N79-32833

REUSABLE HEAT SHIELDING
Effect of 25 cycles of launch pad exposure and simulated mission heating on space shuttle reusable surface insulation coated with reaction cured glass
[NASA-TM-80160] N79-32358

REVERSE FIELD PINCH
Some properties of the reverse-field Z-pinch: An overview
[LA-7798-MS] N79-33050

REVERSING
Reverse annealing in radiation-damaged, silicon solar cells
N79-32660

REVIEWING
A critical review of relevant literature --- relating to stress analysis of pressure vessels
N79-32578

REVISIONS
The automatic revision of storage structures
N79-32844

REYNOLDS NUMBER
An investigation of low Reynolds number free vertical jet flows
N79-32155
Laminar condensation phenomenon associated with a moving droplet
N79-32495

RHEOLOGY
Structure-property relations of elastomeric ABA triblock copolymers
N79-32355

RIDING QUALITY
Paratransit vehicle test and evaluation. Volume 5: Noise tests
[PB-295479/0] N79-33110

RIEMANN WAVES
Development of random choice numerical methods for blast wave problems
[AD-A071156] N79-32439

RING STRUCTURES
Inplane and out of plane buckling of thick rings subjected to hydrostatic pressure
N79-32573

RINGS [MATHEMATICS]
Torsion theories with the bounded splitting property --- limited to commutative rings
N79-32963

RISK
Risk assessment for radioactive waste disposal
[AECL-6322] N79-33001

RIVER BASINS
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
Geologic application of thermal-inertia mapping from satellite --- Powder River Basin, Arizona and Wyoming
[E79-10282] N79-32607
River quality models near outfalls
[OUEL-1270/78] N79-32752

RIVERS
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609
Streamflow simulation studies of the Hillsbrough Alafia, and Anclote rivers, west central Florida
[PB-295569/8] N79-32626
RIVETED JOINTS
Effect of an anti-corrosion penetrant on the fatigue life of various riveted joints during flight simulation tests
[NLR-TR-77103-U] N79-32350
ROADS
Chemical de-icing of roads: The effect on road accidents
[VTI-145] N79-33106
ROCKET ENGINES
Evaluation of candidate metals in a simulated space shuttle main engine environment for application as turbine blade dampers
[NASA-CR-161299] N79-32325
ROCKET PROPELLANTS
Experience with fluorine and its safe use as a propellant
[NASA-CR-162296] N79-32369
ROCKET SOUNDING
Aeronomy sounding rocket program. Results of the guard ring probe experiment flown on the payload B1 of the National Aeronomy Winter Anomaly and Trace Constituents program at El Arenosillo, Spain, between December 1975 and January 1976
[BMFT-FB-W-78-26] N79-32253
Rocket-based measurement of Birkeland currents in an active post-midnight aurora
N79-32762
ROCKET THRUST
Aspects of the performance of chemical rocket thrust systems
[TUM-LRT-RT-TB-78/3] N79-32263
ROCKS
Heat pump/rock bed storage systems --- computer program for economic analysis
[COO-4704-2] N79-32705
ROCKWELL HARDNESS
A new method for the measurement of Rockwell diamond indenters
[NPL-MOM-33] N79-32557
ROOM TEMPERATURE
High-energy electron-induced damage production at room temperature in aluminum-doped silicon
N79-32662
ROOMS
Applications of the modulation transfer function in room acoustics
[IZF-1978-19] N79-32975
ROTARY WINGS
Preliminary airworthiness evaluation CH-47C with fiberglass rotor blades with T55-L-712 engines
[AD-A069891] N79-32199
Some nonlinear problems in transonic helicopter acoustics
[AD-A069564] N79-32974
ROTATING BODIES
A mathematical analysis of the rotary piercing process
N79-32548
ROTATING LIQUIDS
Generation of a rotating liquid liner by tangential injection
[AD-A070890] N79-33038
ROTATING PLASMAS
Magnetized whirls in plasma discharges
[FOA-C-20303-D9] N79-33063
ROTATING SHAFTS
Dynamic response of a rotating, balanced, flexible shaft supported by a thermodynamic bearing system
N79-32549
ROTOR AERODYNAMICS
Some nonlinear problems in transonic helicopter acoustics
[AD-A069564] N79-32974
RUBBER
Formation and properties of rubber-modified epoxies
N79-32357
A study of wire coating extrusion
N79-32396
RUNGE-KUTTA METHOD
Generalized disks of contractivity for explicit and implicit Runge-Kutta methods
[NASA-CR-162125] N79-32940
RUNWAYS
Comparison of some methods to determine the delays of landing aircraft with respect to runway capacity
[NLR-MP-77028-U] N79-32191
RURAL AREAS
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model --- Los Angeles, California and St. Louis, Missouri
[E79-10269] N79-32604
RUTHENIUM
Photoemission studies of H2S, H2, and S adsorbed on Ru[110]: Evidence for an adsorbed SH species
[AD-A070054] N79-32307

S

S WAVES
Shear wave propagation in unconsolidated fluid saturated porous media
N79-32490
S-N DIAGRAMS
Fatigue testing of titanium 6Al4V
[FFA-TN-HU-1993] N79-32348
SACRAMENTO VALLEY [CA]
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
SAFETY
Factor of safety - USAF design practice --- conferences
[AD-A070237] N79-32183
SAFETY DEVICES
Aircraft vortex marking program
[NASA-CR-162299] N79-32156
Safety shield for vacuum/pressure chamber viewing port
[NASA-CASE-GSC-12513-1] N79-32217
SAFETY FACTORS
Experience with fluorine and its safe use as a propellant
[NASA-CR-162296] N79-32369
SAFETY MANAGEMENT
Rules and procedures for the design and operation of hazardous research equipment
[PUB-3001] N79-32397
Nuclear safeguards research and development
[LA-7616-PR] N79-32996
SALINITY
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609
SALT BATHS
Heat treatment studies of aluminum alloy type 7050 forgings. Corroded-specimen fatigue tests and SSC propagation tests
[NLR-TR-77124-U] N79-32351
SALT SPRAY TESTS
The axial loading corrosion fatigue properties of 25mm thick high and low strength X166 plate [DTD 5120 and DTD 5130]
[RAE-TR-78114] N79-32600
SAMARIUM COMPOUNDS
The 150 KVA samarium cobalt USCF starter generator electrical system
[AD-A070078] N79-32468
SAN JOAQUIN VALLEY [CA]
Potential use of wood and agriculture wastes as steam generator fuel for thermal enhanced oil recovery
[SAN-1038-PO-1] N79-32717
SANDS
Effects of interface conductivity on electric logging in western gas sands: A literature review
[BETC/IC-79/2] N79-32621
SANDWICH STRUCTURES
Thermal conductance measurement of honeycomb sandwich panels with carbon fiber reinforced plastic face sheets
[NLR-TR-78081-U] N79-32285
SATELLITE ATTITUDE CONTROL
Survey of modern control and observation theory for disturbed, target following aerospace systems. Part 2: Stochastic performance and spacecraft application
[NLR-TR-78082-U-PT-2] N79-32261
SATELLITE DESIGN
ARIANE Passenger Experiment [APEX]: Planning study
[BMFT-FB-W-77-24] N79-32244
SATELLITE INSTRUMENTS
Study on expenditure optimization for satellite and Spacelab experiments
[BMFT-FB-W-78-34] N79-32246
SATELLITE OBSERVATION
Advanced training and research on satellite remote sensing techniques and applications in the United Kingdom and the United States, 1 October 1977 to 30 September 1978
[AGLT/RSU-SERIES-2/79] N79-32622
A catalog of low-frequency oscillations of the earth's magnetic field as observed as SMS-2 and GOES-2 during December 1977
[PB-294327/2] N79-32793
Earth Radiation Budget Science, 1978 --- conferences
[NASA-CP-2100] N79-32797
Earth Radiation Budget Science, 1978. 1: Introduction --- to obtain radiation budget measurements by satellite observation
N79-32798
Satellite observations of rapidly varying cosmic X-ray sources
N79-33147
SATELLITE PERTURBATION
Multiple attitude maneuvers for a spinning spacecraft disturbed by solar radiation
[NLR-TR-78078-U] N79-32260
SATELLITE POWER TRANSMISSION [TO EARTH]
Economic and demographic issues related to deployment of the Satellite Power System [SPS]
[NASA-CR-158886] N79-32699
SATELLITE SOLAR ENERGY CONVERSION
The NASA Lewis Research Center program in space solar cell research and technology --- efficient silicon solar cell development program
N79-32641
Solar photovoltaic research and development program of the Air Force Aero Propulsion Laboratory --- silicon solar cell applicable to satellite power systems
N79-32642
SATELLITE TEMPERATURE
Heat balance research with a thin-walled cube in a simulated space environment --- satellite design criteria
[NLR-TR-78080-U] N79-32522
SATELLITE TRACKING
Correlation techniques for deep space uncorrelated targets
[AD-A071014] N79-32425
High power phase locked laser oscillators
[NASA-CR-159630] N79-32538
SATELLITE-BORNE INSTRUMENTS
Radiation budget and related measurements in 1985 and beyond --- earth radiation budget satellite system
N79-32804
SATELLITES
Some investigations on the notching procedure used in shaker tests on satellites
[NLR-TR-76134-U] N79-32255
SCALING LAWS
On the scaling of magnetic plasma confinement under classical conditions
[TRITA-PFU-79-05] N79-33064
SCANNERS
Low pressure chemical ionization studies using rapid scan ICR spectroscopy
N79-32293
HUD utilities demonstration series. Volume 9: Description of the data acquisition and instrumentation systems, Jersey City total energy project --- for energy use and energy plant operations on a building complex
[PB-294926/1] N79-32738
SCATTER PROPAGATION
Calculation of forward scattered intensity from particles at optical beam propagation
[FOA-C-30164-E1] N79-33026
SCATTERING AMPLITUDE
Properties of multistep amplitudes in charge-exchange reactions
[UCRL-82665] N79-33002
SCATTERING CROSS SECTIONS
Inelastic electronic collision in hydrocarbons and dyes
[AD-A070172] N79-32986
SCENE ANALYSIS
Segmentation of static and dynamic scenes
N79-32870
SCHEDULING
Reliability analysis and optimum maintenance scheduling of molded-case circuit breakers
N79-32461
SCINTILLATION
Predicting transionospheric propagation conditions
[AD-A070283] N79-32421
SCRUBBERS
Engineering study of the flue gas desulfurization unit for the power plant Weiher 3
[BMFT-FB-T-78-28] N79-32751
SEA TRUTH
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609
SEA WATER
Galvanic corrosion of piping and fitting alloys in sulfide-modified seawater
[AD-A070677] N79-32333
Development of supercorroding alloys for use as timed releases for ocean engineering applications
[AD-A070860] N79-32334
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609
Satellite monitoring of sea surface pollution --- North Sea
[E79-10287] N79-32611
SEALS [STOPPERS]
Development of spiral-groove self-acting seals for helicopter engines
[NASA-CR-159622] N79-32551
SEARCH PROFILES
On search performance for conjunctive queries in compressed, fully transposed ordered files
[TRITA-NA-79-08] N79-33104

SEATS
Release-rate calorimetry of multilayered materials for aircraft seats
[NASA-TM-78594] N79-32265
SECONDARY COSMIC RAYS
Investigation of the anomalous component of low energy cosmic rays: Experimental results and a numerical model
[MPI-PAE/EXTRATERR-147] N79-33148
SEDIMENTS
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609
Suspended sediment in breaking waves N79-32817
SEISMIC WAVES
Seismological studies using observed and synthetic waveforms --- included are wave amplitudes from earthquakes and nuclear explosions N79-32757
Improvement of the MVD method [Migration Velocity Determination]
[BMFT-FB-T-78-30] N79-32779
SEISMOLOGY
Seismological studies using observed and synthetic waveforms --- included are wave amplitudes from earthquakes and nuclear explosions N79-32757
Seismic determination of impact times of supersonic projectiles
[SAND-78-1077] N79-32775
SELECTION
Selecting aluminum alloys to resist failure by fracture mechanisms
[ALCOA-57-77-24-REV] N79-32323
SELENOLOGY
Lunar studies
[NASA-CR-162318] N79-33141
SELF DIFFUSION [SOLID STATE]
Lateral diffusion in model membranes by pulsed nuclear magnetic resonance --- to investigate molecular dynamics of liquid crystal systems N79-32978
SEMICONDUCTING FILMS
Semiconducting properties of passive films on tin in slightly alkaline solutions N79-32294
Development of suitable semi-conductor-evaporated coatings for a color-striped vidicon for a single tube color camera
[BMFT-FB-T-78-39] N79-33025
SEMICONDUCTOR DEVICES
Feasibility study of silicon nitride protection of plastic encapsulated semiconductors
[NASA-CR-161302] N79-32266
Modern technology for semiconductor devices
[BMFT-FB-T-78-21] N79-32484
Computer modeling of a two-junction, monolithic cascade solar cell N79-32672
SEMICONDUCTOR DIODES
Light emitting diodes. A comparative 10,000 hour service test of light emitting diodes, including 26 variants from 15 manufacturers
[ECR-85] N79-32566
SEMICONDUCTOR JUNCTIONS
Limiting process in shallow junction solar cells N79-32646
Design considerations for the Tandem Junction Solar Cell N79-32651
Shallow-homojunction GaAs solar cells N79-32666
Intercell ohmic contacts for high efficiency multijunction solar converters N79-32673
SEMICONDUCTORS [MATERIALS]
Electrical properties of thin GaAs films deposited by sputtering
[AD-A070017] N79-33081
The study and identification of residual donor species in high purity semiconductors
[AD-A071059] N79-33087
SENSORIMOTOR PERFORMANCE
A theoretical and experimental analysis of the outside world perception process
[NLR-MP-78020-U] N79-32835
SENSORS
Distributed sensor networks
[AD-A070455] N79-32438
SERIES [MATHEMATICS]
Theory of connectivity: A unified approach to boundary methods --- integral equations and series expansions
[AD-A070198] N79-32909
SET THEORY
A new proof of a Muentz-type theorem of Korevaar and Dixon
[CTH-MATH-1979-7] N79-32934
A self-avoiding random walk --- on the integer lattice for three or more dimensions N79-32962
SHAKERS
Some investigations on the notching procedure used in shaker tests on satellites
[NLR-TR-76134-U] N79-32255
SHALE OIL
Mathematical model of forward combustion retorting of oil shale
[LETC/TPR-78/1] N79-32375
SHEAR STRAIN
A high-order theory of laminated plate deformation N79-32274
SHEAR STRESS
Residual stresses in ground steels
[AD-A070798] N79-32584
SHELL THEORY
Numerical analysis of pressure vessels using various shell theories
[IIT-B/CE-79-1] N79-32576
Numerical analysis of pressure vessels using various shell theories: Introduction N79-32577
Problem formulation --- governing equations for the behavior of general shell forms N79-32579
Numerical results --- analysis of pressure vessels using various shell theories N79-32581
Numerical analysis of pressure vessels using various shell theories: Discussions and conclusions N79-32582
SHELLS [STRUCTURAL FORMS]
Dynamic analysis of cylindrical shells with cutouts and cracks N79-32572
Numerical analysis of pressure vessels using various shell theories
[IIT-B/CE-79-1] N79-32576
Problem formulation --- governing equations for the behavior of general shell forms N79-32579
Numerical results --- analysis of pressure vessels using various shell theories N79-32581
Numerical analysis of pressure vessels using various shell theories: Discussions and conclusions N79-32582
SHIPS
Qualification tests for helicopters to be used on board ships
[NLR-MP-78032-U] N79-32204
Computer display set AN/UYQ-21 TECHEVAL test. System meets all specifications and is judged to be suitable for OPEVAL
[AD-A070260] N79-32857
SHOCK TUBES
Shock tube studies of reaction and energy transfer rates between molecules and reactive atoms N79-32980
SHOCK WAVES
The response of germanium to large amplitude shock waves
[AD-A070454] N79-33079
SHORELINES
Feature selection via entropy minimization: An example using LANDSAT satellite data --- forested shorelines near Lake Massaciuccole between Lucca and Pisa, Italy
[E79-10286] N79-32610
SIDELOBES
Radiation pattern sidelobes and null filling produced by aircraft vibration
[AD-A070472] N79-32422
Metal grid angular filters for sidelobe suppression
[AD-A070111] N79-32424
SIERRA NEVADA MOUNTAINS [CA]
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
SIGNAL ANALYSIS
Spectral characteristics of convolutionally coded digital signals
[NASA-CR-162295] N79-32412
Calculation of the correlation region size for use with alpha-beta tracking filters
[AD-A072083] N79-32414
SIGNAL DETECTION
Modelling and system identification for the inphase/quadrature process N79-32407
The use of artificial signals during SONAR-watch
[IZF-1978-25] N79-32837
Experimental superposition of acoustic fields for detection performance studies
[AD-A070963] N79-32970
SIGNAL DETECTORS
Asymptotically optimum zero memory detectors for dependent noise process
[AD-A069982] N79-32433
Robust detectors based on the occupancy vector N79-32905
SIGNAL ENCODING
User's manual for SCWAR: A multiwire shielded cable code for a systems oriented EMP vulnerability assessment program
[AD-A070884] N79-32427
SIGNAL MIXING
Baseband signal combiner for antenna array
[NASA-CASE-NPO-14641-1] N79-32408
SIGNAL PROCESSING
Baseband signal combiner for antenna array
[NASA-CASE-NPO-14641-1] N79-32408
Asymptotically optimum zero memory detectors for dependent noise process
[AD-A069982] N79-32433
Block implementation of digital filters N79-32462
Transient behavior of the LMS adaptive filter-response to variable frequency spectral lines
[AD-A070470] N79-32470
Electronic processing of infrared scanner signals using CCD memory techniques
[NLR-MP-78031-U] N79-32623
HUD utilities demonstration series. Volume 9: Description of the data acquisition and instrumentation systems, Jersey City total energy project --- for energy use and energy plant operations on a building complex
[PB-294926/1] N79-32738
PROCOPES [Conversational Program for Signal Processing]: Evolution toward an interpretative command language
[ONERA-NT-1978-8] N79-32883
SIGNAL RECEPTION
Jamming signal reduction in spread spectrum systems
[AD-A069947] N79-32435
SIGNAL TO NOISE RATIOS
Jamming signal reduction in spread spectrum systems
[AD-A069947] N79-32435
Uncertainties in adaptive maximum entropy frequency estimators
[PB-296131/6] N79-32489
SIGNAL TRANSMISSION
Modulation-delay equalisation applied to common-frequency h.f. circuits: An assessment of the likely improvement
[BBC-RD-1979/13] N79-32404
SIGNATURE ANALYSIS
Feature selection via entropy minimization: An example using LANDSAT satellite data --- forested shorelines near Lake Massaciuccole between Lucca and Pisa, Italy
[E79-10286] N79-32610
SILICA GLASS
Technology of interfaces on silicate glass passivated semiconductor power devices
[BMFT-FB-T-78-40] N79-32486
SILICON
Silicon-gate CMOS/SOS processing
[NASA-CR-150319] N79-32464
The NASA Lewis Research Center program in space solar cell research and technology --- efficient silicon solar cell development program N79-32641
Solar photovoltaic research and development program of the Air Force Aero Propulsion Laboratory --- silicon solar cell applicable to satellite power systems N79-32642
The JPL space photovoltaic program --- energy efficient sol silicon solar cells for space applications N79-32643
Updating the limit efficiency of silicon solar cells N79-32645
Limiting process in shallow junction solar cells N79-32646
Design of high efficiency HLE solar cells for space and terrestrial applications N79-32647
Applications of ion implantation to high performance, radiation tolerant silicon solar cells N79-32648
Exploratory developmeat on silicon material for LADIR --- growth of gallium-doped silicon crystals
[AD-A070740] N79-33017
SILICON ALLOYS
Silicon-germanium alloys for infrared detectors
[AD-A070932] N79-33018
SILICON CARBIDES
Ceramic heat pipes for high temperature heat removal
[LA-UR-79-332] N79-32518
SILICON NITRIDES
Feasibility study of silicon nitride protection of plastic encapsulated semiconductors
[NASA-CR-161302] N79-32266
Survivability of silicon nitride bearing
[AD-A070383] N79-32553
SILICON TRANSISTORS
PNP: planar transistor technology
[BMFT-FB-T-78-20] N79-32483
Modern technology for semiconductor devices
[BMFT-FB-T-78-21] N79-32484

SILICONE RUBBER
A filled silicone rubber materials system with selectable acoustic properties for molding and coating applications at ultrasonic frequencies
[AD-A070461] N79-32972
SIMULATION
Microwave experimental simulation of laser plasma interactions
[UCLA-ENG-7931] N79-33051
Simulation of cometary magnetic tails
[PR-439] N79-33143
SIMULATORS
Computational nature of combustion modeling
[SAND-78-8245] N79-32313
SINGLE CRYSTALS
Fatigue failure prediction by X-ray double crystal diffractometry
[AD-A070296] N79-32327
Development of fluorides for high power laser optics
[NVO-1555-4] N79-32546
Silicon-germanium alloys for infrared detectors
[AD-A070932] N79-33018
Deformation twinning and its role in the cavitation erosion response of HCP Co single crystals
N79-33078
The response of germanium to large amplitude shock waves
[AD-A070454] N79-33079
Study Czochralski liquid-seal crystal growing technique
[AD-A070280] N79-33085
Orientation of crystalline overlayers on amorphous substrates by artificially produced surface relief structures
[AD-A071168] N79-33091
SIRIO SATELLITE
SIRIO 2: Satellite for European Space Agency. Executive summary
N79-32252
SITES
Impacts of the Resource Conservation and Recovery Act on the siting of coal-conversion energy facilities in the United States
[ORNL/OEPA-12] N79-32724
SKIN [STRUCTURAL MEMBER]
Gust spectrum fatigue crack propagation in candidate skin materials
[NLR-MP-78022-U] N79-32597
SKYLARK ROCKET VEHICLE
Magnetosphere sounding rocket program. A substorm phenomena payload. Report on system design, integration, testing, and flight
[BMFT-FB-W-78-35] N79-32247
SLENDER BODIES
Calculation of subsonic normal force and centre of pressure position of bodies of revolution using a slender body theory: Boundary layer method
[WSRL-0093-TR] N79-32160
Some aerodynamic performance calculations on missile configurations
[AD-A070433] N79-32168
Heat-transfer measurements on a 5-deg sharp cone using infrared scanning and on-board discrete sensor techniques
[AD-A070363] N79-32169
SLIDING
Apex singularities for corner cracks under opening, sliding, and tearing modes
[AD-A070200] N79-32587
SLIDING FRICTION
Evaluation and auger analysis of a zinc-dialkyldithiophosphate antiwear additive in several diester lubricants
[NASA-TP-1544] N79-32359
SMOKE
Engineering study of the flue gas desulfurization unit for the power plant Weiher 3
[BMFT-FB-T-78-28] N79-32751
SMS 2
A catalog of low-frequency oscillations of the earth's magnetic field as observed as SMS-2 and GOES-2 during December 1977
[PB-294327/2] N79-32793
SNOW COVER
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
SOCIAL FACTORS
Decentralized solar energy technology assessment program: Research plan
[ORNL/TM-6913] N79-32677
Fossil energy program summary document
[DOE/ET-0087] N79-32696
Economic and demographic issues related to deployment of the Satellite Power System [SPS]
[NASA-CR-158886] N79-32699
SOCIOLOGY
Algebraic systems: Applications in the behavioral and social sciences
[AD-A070103] N79-32966
SODIUM CHLORIDES
Chemical de-icing of roads: The effect on road accidents
[VTI-145] N79-33106
SOIL MAPPING
The mapping of Martian soil density. A comparison of albedo, topography, and geology
[PR-417] N79-33142
SOIL MOISTURE
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
[E79-10271] N79-32605
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions --- Rio Grande Valley, Texas
[E79-10280] N79-32606
SOILS
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions --- Rio Grande Valley, Texas
[E79-10280] N79-32606
Overview of waste heat utilization techniques --- spray irrigation, soil heating, aquiculture and biomass production
[CONF-790443-2] N79-32726
SOLAR ACTIVITY
Solar-geophysical data number 415, March 1979. Part 1: Prompt reports, data for February 1979, January 1979
[PB-296275/1] N79-33146
SOLAR ACTIVITY EFFECTS
Electric fields in the outer magnetosphere: Recent progress and outstanding problems
[TRITA-EPP-79-03] N79-32783
The effect of solar output, infrared cooling and latitudinal heat transport on the evolution of the earth's climate
[AERONOMICA-ACTA-A-200-1979]
N79-32794
SOLAR ARRAYS
LSA project technology development update
[NASA-CR-162301] N79-32633
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 1: Study overview and summary
[NASA-CR-162328] N79-32638
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 2: Technical
[HAC-REF-E3256-VOL-2] N79-32639
Silicon solar cells for space use: Present performance and trends
N79-32654
An interim report on the NTS-2 solar cell experiment
N79-32656
SOLAR CELLS
Characterization of solar cells for space applications. Volume 8: Electrical characteristics of Spectrolab BSF, BSR, textured 290-micron solar cells [K7] as a function of intensity, temperature and irradiation
[NASA-CR-162290] N79-32630
Characterization of solar cells for space applications. Volume 9: Electrical characteristics of Spectrolab BSF, textured, 10-ohm-cm 200-micron cells as a function of intensity, temperature, and irradiation
[NASA-CR-162289] N79-32631
LSA project technology development update
[NASA-CR-162301] N79-32633
Results of the 1978 NASA/JPL balloon flight solar cell calibration program
[NASA-CR-162298] N79-32635
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 1: Study overview and summary
[NASA-CR-162328] N79-32638
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 2: Technical
[HAC-REF-E3256-VOL-2] N79-32639
Solar Cell High Efficiency and Radiation Damage, 1979
[NASA-CP-2097] N79-32640
The NASA Lewis Research Center program in space solar cell research and technology --- efficient silicon solar cell development program
N79-32641
Solar photovoltaic research and development program of the Air Force Aero Propulsion Laboratory --- silicon solar cell applicable to satellite power systems
N79-32642
The JPL space photovoltaic program --- energy efficient sol silicon solar cells for space applications
N79-32643
Langley program of GaAs solar cells --- emphasizing energy conversion efficiency and radiation resistance
N79-32644
Updating the limit efficiency of silicon solar cells
N79-32645
Limiting process in shallow junction solar cells
N79-32646
Design of high efficiency HLE solar cells for space and terrestrial applications
N79-32647
Applications of ion implantation to high performance, radiation tolerant silicon solar cells
N79-32648
Open-circuit voltage improvements in low-resistivity solar cells
N79-32649
Modeling of thin, back-wall silicon solar cells
N79-32650
Design considerations for the Tandem Junction Solar Cell
N79-32651
Thin cells for space
N79-32652
High efficiency cell geometry
N79-32653
Silicon solar cells for space use: Present performance and trends
N79-32654
Laser Techniques in Photovoltaic Research
N79-32655
An interim report on the NTS-2 solar cell experiment
N79-32656
Electron irradiation of tandem junction solar cells
N79-32657
Radiation damage in high-voltage silicon solar cells
N79-32658
CO2 laser annealing of 50-microns-thick silicon solar cells
N79-32659
Reverse annealing in radiation-damaged, silicon solar cells
N79-32660
Effect of dopants on annealing performance of silicon solar cells
N79-32661
High-energy electron-induced damage production at room temperature in aluminum-doped silicon
N79-32662
Radiation damage in GaAs solar cells
N79-32663
Fabrication of high efficiency and radiation resistant GaAs solar cells
N79-32664
Temperature and intensity dependence of the performance of an electron-irradiated [AlGa]As/GaAs solar cell
N79-32665
Shallow-homojunction GaAs solar cells
N79-32666
Radiation effects in GaAs AMOS solar cells
N79-32667
Capacitance transients in p-type GaAs MOS structures and application to lifetime mapping during solar cell fabrication
N79-32668
Summary of GaAs Solar Cell Performance and Radiation Damage Workshop
N79-32669
A review of Air Force high efficiency cascaded multiple bandgap solar cell research and development
N79-32670
Efficiency of tandem solar cell systems as function of temperature and solar energy concentration ratio
N79-32671
Computer modeling of a two-junction, monolithic cascade solar cell
N79-32672
Intercell ohmic contacts for high efficiency multijunction solar converters
N79-32673
Cadmium sulfide-copper sulfide heterojunction cell research
[SAN-1459-3] N79-32701
Avoiding future health problems related to solar energy [photovoltaic] technology
[BNL-25935] N79-32718
Investigation of low cost solar cells based on Cu2O --- MIS solar cell theory
[PB-295888/2] N79-32737
SOLAR COLLECTORS
A preliminary assessment of small steam Rankine and Brayton point-focusing solar modules
[NASA-CR-162302] N79-32632
Evaluation of a large nonconvective solar pond
[MLM-2606[OP]] N79-32680
Performance testing of the Del concentrating solar collector
[SAND-79-0515] N79-32681
Combined photovoltaic/thermal system studies
[SAND-78-7031] N79-32691
Isothermal flow distribution in solar collectors and collector manifolds
[ALO-5319-1] N79-32708
Effects of noncontact cleaners on transparent solar materials
[PNL-2969] N79-32709
Structural optimization of sheet molding compound line focusing collectors
[SAND-79-0215C] N79-32710

Small-scale solar simulator for indoor testing of collector modules and materials
[LA-UR-79-1335] N79-32716

SOLAR COOLING
Solar Heating And Cooling Of Buildings [SHACOB]: Requirements definition and impact analysis
[EPRI-ER-808-SY] N79-32687
Theoretical analysis of a passive heat pipe heating and cool system
[PB-296066/4] N79-32736

SOLAR CORONA
Proposal for an interplanetary mission to sound the outer regions of the solar corona
N79-32248

SOLAR ENERGY
Performance evaluation of solar films and screens
[AD-A070039] N79-32674
Stratified thermal storage in residential Solar energy applications
[COO-4523-1] N79-32682
Solar thermal test facilities users association
[SERI/PR-13-154] N79-32688
Heliostat beam characterization system
[SAND-79-0697/C] N79-32703
Meteorological data for solar energy applications
N79-32733

SOLAR ENERGY ABSORBERS
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 1: Study overview and summary
[NASA-CR-162328] N79-32638
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 2: Technical
[HAC-REF-E3256-VOL-2] N79-32639

SOLAR ENERGY CONVERSION
A preliminary assessment of small steam Rankine and Brayton point-focusing solar modules
[NASA-CR-162302] N79-32632
Results of the 1978 NASA/JPL balloon flight solar cell calibration program
[NASA-CR-162298] N79-32635
The JPL space photovoltaic program --- energy efficient sol silicon solar cells for space applications
N79-32643
Intercell ohmic contacts for high efficiency multijunction solar converters
N79-32673
Decentralized solar energy technology assessment program: Research plan
[ORNL/TM-6913] N79-32677
Solar Repowering Workshop
[SERI/TP-35-57] N79-32689
Combined photovoltaic/thermal system studies
[SAND-78-7031] N79-32691
Systems analysis of solar thermal power systems. Report on task 1: Determination and characterization of solar thermal conversion options
[PNL-2693] N79-32692
Field tests of photovoltaic power systems
[COO-4094-32] N79-32700
Experimental performance study of a series solar heat pump
[BNL-25928] N79-32704
Heat pump/rock bed storage systems --- computer program for economic analysis
[COO-4704-2] N79-32705
Status review of the technology assessment of solar energy program
[LA-UR-79-1369] N79-32714
Application and system design study for cost-effective solar photovoltaic systems at Federal installations
[HCP/M2522-01] N79-32715
Development of a prototype 10kW solar power plant
[BMFT-FB-T-78-33] N79-32730
Theoretical analysis of a passive heat pipe heating and cool system
[PB-296066/4] N79-32736

SOLAR FLARES
Solar-geophysical data number 415, March 1979. Part 1: Prompt reports, data for February 1979, January 1979
[PB-296275/1] N79-33146

SOLAR FLUX DENSITY
Some evolution and stability trends deduced from energy and water vapor balance models
[AERONOMICA-ACTA-A-201-1979] N79-32795

SOLAR FURNACES
Extraterrestrial fiberglass production using solar energy --- lunar plants or space manufacturing facilities
N79-32237

SOLAR GENERATORS
Intercell ohmic contacts for high efficiency multijunction solar converters
N79-32673

SOLAR HEATING
Solar Heating And Cooling Of Buildings [SHACOB]: Requirements definition and impact analysis
[EPRI-ER-808-SY] N79-32687
Passive solar heating for buildings
[LA-UR-78-427] N79-32706
Production of high-energy chemicals using solar energy heat
[ORNL/SUB-7390/1] N79-32707
Theoretical analysis of a passive heat pipe heating and cool system
[PB-296066/4] N79-32736
Heating of spherical interplanetary particles close to the sun [solar probe HELIOS A and B: Experiment 10 z]
[BMFT-FB-W-78-33] N79-33145

SOLAR ORBITS
Proposal for an interplanetary mission to sound the outer regions of the solar corona
N79-32248
Nutation of Mars
[NASA-CR-162300] N79-33140

SOLAR PONDS [HEAT STORAGE]
Evaluation of a large nonconvective solar pond
[MLM-2606(OP)] N79-32680

SOLAR POWER SATELLITES
Habitat and logistic support requirements for the initiation of a space manufacturing enterprise
N79-32229

SOLAR PROTONS
Solar MeV protons recorded during experiment S 99 on board ESRO-4 in 1973
[ESA-STR-203] N79-33144

SOLAR RADIATION
Heliostat beam characterization system
[SAND-79-0697/C] N79-32703
Solar radiation model validation
[SAND-79-1120C] N79-32712
Atmospheric extinction. 1: Synthetic data
[AD-A071006] N79-32772
Radiation modeling --- solar and terrestrial radiation
N79-32801

SOLAR RADIO EMISSION
Solar-geophysical data number 415, March 1979. Part 1: Prompt reports, data for February 1979, January 1979
[PB-296275/1] N79-33146

SOLAR REFLECTORS
Evaluation of cellular glasses for solar mirror panel applications
[NASA-CR-162303] N79-32634
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 1: Study overview and summary
[NASA-CR-162328] N79-32638
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 2: Technical
[HAC-REF-E3256-VOL-2] N79-32639
Microscopic investigation of electrostatic discharge phenomena on nonconductive optical solar reflectors with a conductive adhesive
[ESA-STM-211] N79-32729

SOLAR SENSORS
Microprocessor-controlled autonomous sun-following mount for solar photovoltaic energy planning
[COO-4094-34] N79-32702

SOLAR SIMULATORS
Small-scale solar simulator for indoor testing of collector modules and materials
[LA-UR-79-1335] N79-32716

SOLAR SYSTEM
Nucleosynthesis in supernovae and the origin of isotopic heterogeneity in the early solar system
N79-33126

SOLAR TERRESTRIAL INTERACTIONS
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model --- Los Angeles, California and St. Louis, Missouri
[E79-10269] N79-32604
Potential prediction needs in support of energy systems --- solar-terrestrial interactions
[LA-UR-79-673] N79-32698

SOLAR TOTAL ENERGY SYSTEMS
Thermal energy storage for advanced solar central receiver power systems
[SAND-78-8221] N79-32694

SOLAR WIND
An electric current model of the magnetosphere
[TRITA-EPP-79-09] N79-32784

SOLID PROPELLANT COMBUSTION
Research on unsteady combustion processes
[AD-A069545] N79-32262

SOLID PROPELLANT ROCKET ENGINES
Research on unsteady combustion processes
[AD-A069545] N79-32262

SOLID ROCKET PROPELLANTS
Research on unsteady combustion processes
[AD-A069545] N79-32262
An application of the theory of materials with variable bonding to solid propellant
[AD-A070188] N79-32370

SOLID SOLUTIONS
Correlation between the kinetic and thermodynamic properties of interstitial solid solutions
N79-33077

SOLID-SOLID INTERFACES
Technology of interfaces on silicate glass passivated semiconductor power devices
[BMFT-FB-T-78-40] N79-32486
Contact stresses on bodies with arbitrary geometry
N79-32569

SOLIDIFICATION
A survey of the available methods of solidification for radioactive wastes
[PB-295214/1] N79-33010

SOLIDS
Static and dynamic finite deformations of viscoelastic solids and structures
N79-32567
Theory of phase transitions in gases adsorbed on solids
N79-33072

SONAR
Robust optimal systems in radar and communications
N79-32406
The use of artificial signals during SONAR-watch
[IZF-1978-25] N79-32837

SORPTION
Statistical thermodynamics of sorption in molecular sieves
N79-33095

SOS [SEMICONDUCTORS]
Silicon-gate CMOS/SOS processing
[NASA-CR-150319] N79-32464
Expansion of CMOS array design techniques
[NASA-CR-150318] N79-32628

SOUND FIELDS
Experimental superposition of acoustic fields for detection performance studies
[AD-A070963] N79-32970

SOUND PROPAGATION
A summary of the results of a study of acoustic interaction with the sea floor
[AD-A070954] N79-32973

SOUND TRANSMISSION
A filled silicone rubber materials system with selectable acoustic properties for molding and coating applications at ultrasonic frequencies
[AD-A070461] N79-32972
A summary of the results of a study of acoustic interaction with the sea floor
[AD-A070954] N79-32973

SOUNDING ROCKETS
Meteorological rocket network system reliability
[AD-A070187] N79-32808

SPACE COLONIES
Space resources and space settlements
[NASA-SP-428] N79-32225
Systems engineering overview for regenerative life-support systems applicable to space habitats
N79-32226
Effect of environmental parameters on habitat structural weight and cost
N79-32228

SPACE COMMUNICATION
Evaluation of the JPL X-band 32 element active array --- for deep space communication
[NASA-CR-162297] N79-32409

SPACE ENVIRONMENT SIMULATION
Measurement of the velocity of small projectiles using microwaves
[TUM-LRT-RT-TB-77/01] N79-32444
Heat balance research with a thin-walled cube in a simulated space environment --- satellite design criteria
[NLR-TR-78080-U] N79-32522
Characterization of solar cells for space applications. Volume 9: Electrical characteristics of Spectrolub BSF, textured, 10-ohm-cm 200-micron cells as a function of intensity, temperature, and irradiation
[NASA-CR-162289] N79-32631

SPACE HEATING [BUILDINGS]
Solar Heating And Cooling Of Buildings [SHACOB]: Requirements definition and impact analysis
[EPRI-ER-808-SY] N79-32687
Experimental performance study of a series solar heat pump
[BNL-25928] N79-32704
Passive solar heating for buildings
[LA-UR-78-427] N79-32706
The use of the heat pumps to raise temperatures in an economical and ecological way --- domestic heating via industrial waste energy
[BMFT-FB-T-78-35] N79-32732
Theoretical analysis of a passive heat pipe heating and cool system
[PB-296066/4] N79-32736
HUD utilities demonstration series. Volume 9: Description of the data acquisition and instrumentation systems, Jersey City total energy project --- for energy use and energy plant operations on a building complex
[PB-294926/1] N79-32738

SPACE INDUSTRIALIZATION
Space resources and space settlements
[NASA-SP-428] N79-32225
Habitat and logistic support requirements for the initiation of a space manufacturing enterprise
N79-32229
Retrieval of asteroidal materials
N79-32234

An assessment of near-earth asteroid resources N79-32235
The initial lunar supply base N79-32236
A geologic assessment of potential lunar ores N79-32239
Extraction processes for the production of aluminum, titanium, iron, magnesium, and oxygen and nonterrestrial sources N79-32240
Mining and beneficiation of lunar ores N79-32241

SPACE MANUFACTURING
Space resources and space settlements [NASA-SP-428] N79-32225
Habitat and logistic support requirements for the initiation of a space manufacturing enterprise N79-32229
The initial lunar supply base N79-32236
Extraterrestrial fiberglass production using solar energy --- lunar plants or space manufacturing facilities N79-32237

SPACE PROCESSING
Round-trip missions to low delta-V asteroids and implications for material retrieval N79-32233

SPACE PROGRAMS
Aeronautics and space report of the President, 1978 activities N79-33115

SPACE SHUTTLES
Data verification tests of a 0.03-scale NASA space shuttle launch vehicle at Mach numbers from 0.60 to 1.55 [AD-A070442] N79-32256
Space shuttle external tank instrumentation evaluation --- wind tunnel tests [AD-A070443] N79-32257
Evaluation of candidate metals in a simulated space shuttle main engine environment for application as turbine blade dampers [NASA-CR-161299] N79-32325
Effect of 25 cycles of launch pad exposure and simulated mission heating on space shuttle reusable surface insulation coated with reaction cured glass [NASA-TM-80160] N79-32358
Control system designs for the shuttle infrared telescope facility [NASA-CR-162321] N79-33121

SPACE TRANSPORTATION
Mass drivers. 1: Electrical design N79-32230
Contributions to the 'Data Systems Engineering in Space Travel' Symposium --- Germany, Jan. 1978 [DLR-MITT-78-02] N79-32243

SPACE TRANSPORTATION SYSTEM
Photoelastic studies of advanced lap joint concept [NASA-CR-162316] N79-32575

SPACEBORNE PHOTOGRAPHY
US Geological Survey sources of photographs and images of biosphere reserves taken from spacecraft and aircraft: Everglades National Park [PB-296353/6] N79-32624

SPACECRAFT ANTENNAS
Evaluation of the JPL X-band 32 element active array --- for deep space communication [NASA-CR-162297] N79-32409

SPACECRAFT COMMUNICATION
Atmospheric propagation research at 20 and 30 GHz [ESA-CR(P)-1201] N79-32447
Millimeter wave low noise front end [CD.6500636] N79-32487

SPACECRAFT DESIGN
Characterization of solar cells for space applications. Volume 8: Electrical characteristics of Spectrolab BSF, BSR, textured 290-micron solar cells [K7] as a function of intensity, temperature and irradiation [NASA-CR-162290] N79-32630
Scientific research, 1977 --- an overview of air transportation, aircraft design, propulsion systems, space technology, and reconnaissance N79-33150

SPACECRAFT ORBITS
Proposal for an interplanetary mission to sound the outer regions of the solar corona N79-32248

SPACECRAFT POWER SUPPLIES
The JPL space photovoltaic program --- energy efficient sol silicon solar cells for space applications N79-32643

SPACECRAFT STABILITY
Multiple attitude maneuvers for a spinning spacecraft disturbed by solar radiation [NLR-TR-78078-U] N79-32260
Survey of modern control and observation theory for disturbed, target following aerospace systems. Part 2: Stochastic performance and spacecraft application [NLR-TR-78082-U-PT-2] N79-32261

SPACECRAFT STRUCTURES
Some investigations on the notching procedure used in shaker tests on satellites [NLR-TR-76134-U] N79-32255

SPACELAB PAYLOADS
Requirements analysis and feasibility study for the Spacelab user program: Supersensitive optical accelerometer [BMFT-FB-W-78-18] N79-32245
Study on expenditure optimization for satellite and Spacelab experiments [BMFT-FB-W-78-34] N79-32246

SPARK GAPS
Investigation of the liquid-layer-on-solid sample spark technique N79-32298
Techniques for observation and control of high voltage spark discharge N79-32460

SPECKLE PATTERNS
Noise in coherent optical systems: Minimum detectable object contrast and speckle smoothing [AD-A070040] N79-33014

SPECTRAL BANDS
Neptune: Limb brightening within the 7300 angstrom methane band [NASA-CR-162319] N79-33122

SPECTRAL EMISSION
Optical detection of spectral diffusion of the triplet state zerofield transition energy --- liquid crystals [AD-A071179] N79-33084

SPECTRAL ENERGY DISTRIBUTION
Spectral measurements of infrared sky radiance [LBL-8778] N79-32776

SPECTRAL SIGNATURES
A microprocessor based image storage and analysis facility for infrared signature measurement and image processing [AD-A070288] N79-32858

SPECTROMETERS
The study and identification of residual donor species in high purity semiconductors [AD-A071059] N79-33087

SPECTROPHOTOMETERS
Wavelength repeatability of a Cary model 14 R spectrophotometer [AD-A070704] N79-32528

SPECTROSCOPIC ANALYSIS
Fourier transform nuclear magnetic resonance spectroscopy applications of chemical interest N79-32979

SPECTRUM ANALYSIS
Experimental evaluation of peak height approximation for X-ray diffracted integrated intensity method [AD-A070800] N79-32329
Spectral characteristics of convolutionally coded digital signals [NASA-CR-162295] N79-32412
Transient behavior of the LMS adaptive filter-response to variable frequency spectral lines [AD-A070470] N79-32470
Uncertainties in adaptive maximum entropy frequency estimators [PB-296131/6] N79-32489
Discrete-time spectral estimation of continuous-time processes: The orthogonal series method spectral estimation by orthogonal series [AD-A070641] N79-32952
The visual and near infrared spectrum of methane and its application to Uranus, Neptune, Triton and Pluto N79-33119
Neptune: Limb brightening within the 7300 angstrom methane band [NASA-CR-162319] N79-33122

SPEECH RECOGNITION
Description of STIDAS 2-c [Speech Transmission Index Device using Artificial Signals]. Part 1: General description [IZF-1978-19] N79-32450
Comparison of some methods for measuring speech levels [IZF-1978-22] N79-32976

SPHERES
Linear stability of self-similar flow: 5. Convective instability in bounded uniform self-gravitating spheres [AD-A070709] N79-32508

SPHERICAL ANTENNAS
On the minimization of spherical aberration in spherical reflector antennas [NASA-TM-80140] N79-32466

SPHERICAL TANKS
Stress concentration factors in spheres with radial flush nozzles [CRIF-MT-129] N79-32601

SPIN RESONANCE
Symmetry breaking in nuclei --- involving isospin and parity N79-32993

SPIN STABILIZATION
Multiple attitude maneuvers for a spinning spacecraft disturbed by solar radiation [NLR-TR-78078-U] N79-32260

SPIRAL GALAXIES
Models of the distribution of photometric properties of galaxies with star formation N79-33118
An optical analysis of dust complexes in spiral galaxies N79-33129

SPLINE FUNCTIONS
On the use of spline functions and collocation in a trajectory optimization algorithm based on mathematical programming [NLR-TR-78016-U] N79-32926
On maximum error and boundary conditions in cubic spline interpolation at equidistant knots [TRITA-NA-79-02] N79-32938

SPLINES
Modal interpolation program, L215 [INTERP]. Volume 1: Engineering and usage [NASA-CR-2847] N79-32164

SPRAYED COATINGS
A microstructural investigation of plasma-sprayed metal and oxide coatings N79-32320
Effect of an anti-corrosion penetrant on the fatigue life of various riveted joints during flight simulation tests [NLR-TR-77103-U] N79-32350
A filled silicone rubber materials system with selectable acoustic properties for molding and coating applications at ultrasonic frequencies [AD-A070461] N79-32972

SPUTTERING
Development of sputtered techniques for thrust chambers [NASA-CR-159637] N79-32326
Sputtering of insulators in the electronic stopping region N79-33070

SQUARE WAVES
Square function analysis of the inductor-converter bridge [ANL/FPP/TM-118] N79-32482
Linear sweep differential pulse voltammetry: Theory and application --- technique and a theoretical equation for combining pulse nature and sweep nature of square waves N79-32525

SQUID [DETECTORS]
The 3 kHz SQUID receiver development [AD-A069709] N79-32429

STABILITY TESTS
Investigations on the aeroelastic stability of large wind turbines [NPL-MP-78014-U] N79-32731

STANDARD DEVIATION
The evaluation and control of the changes in basic statistics encountered in grouped data --- normally distributed data N79-32943

STANDARDIZATION
Wavelength repeatability of a Cary model 14 R spectrophotometer [AD-A070704] N79-32528
Review of unfolding methods used in the US and their standardization for dosimetry [BNWL-SA-6503] N79-32828

STANDARDS
Activities of the Division of Quantum Metrology [NPL-QU-AR-77] N79-32400
Activities of the Division of Quantum Metrology [NPL-QU-AR-78] N79-32401
Geodetic bench marks [PB-296427/8] N79-32792
Eddy current testing and ultrasonic reference standards for depleted uranium barstock [AD-A070295] N79-32971

STAR CLUSTERS
Numerical integration of the orbit-averaged Fokker-Planck equation: The evolution of Plummer's model --- for studying the evolution of star clusters N79-33117

STARK EFFECT
Stark modulation spectroscopy of molecular crystals N79-33066

STARS
An analysis of the effects of optical aberrations on relative positions of stars in the image plane of astrometric telescopes N79-33116

STATIC DEFORMATION
Static and dynamic finite deformations of viscoelastic solids and structures N79-32567

STATIC DISCHARGERS
An investigation into the noise interference problems at Logan Airport, Boston [AD-A072057] N79-32417

STATIC TESTS
Fatigue testing of titanium 6Al4V [FFA-TN-HU-1993] N79-32348

STATISTICAL ANALYSIS
Statistical adjustment of dynamical tropical cyclone model track predictions [AD-A070094] N79-32810
A statistical methodology for constructing synthetic test workloads N79-32865

The evaluation and control of the changes in basic statistics encountered in grouped data --- normally distributed data
N79-32943
Robustness in the strategy of scientific model building
(AD-A070213) N79-32945
Some memorable incidents in probabilistic/statistical studies
(AD-A070023) N79-32947

STATISTICAL CORRELATION
Radiation variability and correlation studies --- earth-atmosphere system
N79-32802

STATISTICAL DISTRIBUTIONS
Robustness in the strategy of scientific model building
(AD-A070213) N79-32945

STATISTICAL TESTS
Application of Bayesian techniques to reliability demonstration, estimation and updating of the prior distribution
(AD-A070236) N79-32559
Tests for dependence
(AD-A069567) N79-32954
A stagewise directional test based on T statistics
(CTH-MATH-1979-3) N79-32957

STATISTICAL WEATHER FORECASTING
Climate diagnostics --- using radiation and meteorological data for diagnosing climatic fluctuations
N79-32800
Modification of NMC analyses and prognoses for use in statistical tropical cyclone prediction models
(PB-297190/1) N79-32814

STEADY FLOW
The mass and heat transfer in laminar pulsatile flow
N79-32492

STEAM
Performance of ceramic materials in high temperature steam and hydrogen
(BNL-25812) N79-32367
Research and development concerning steam gasification of coal: Report on the concept of a prototype plant using nuclear processing heat
(BMFT-FB-T-78-29) N79-32394

STEELS
Collected engineering data sheets, Air Force data sheet program --- airframe materials
(AD-A070665) N79-32201
Microstructural evaluation and non-destructive examination of 2.25 Cr-1 Mo steel
(SAND-77-1557) N79-32340
A fracture mechanics evaluation of creep induced embrittlement
N79-32570

STELLAR EVOLUTION
Numerical integration of the orbit-averaged Fokker-Planck equation: The evolution of Plummer's model --- for studying the evolution of star clusters
N79-33117
Models of the distribution of photometric properties of galaxies with star formation
N79-33118

STELLAR MODELS
An annihilation model of the QSO's
(TRITA-EPP-79-08) N79-33134

STEREOCHEMISTRY
Epimerization of isotactic polystyrene
N79-32354

STEREOPHOTOGRAPHY
Numerical studies of conversion and transformation in a surveillance system employing a multitude of radars, part 2 --- advanced air traffic control services
(AD-A072086) N79-32415
Numerical studies of conversion and transformation in a surveillance system employing a multitude of radars, part 1 --- advanced air traffic control services
(AD-A072085) N79-32416

STIFFENING
Residual strength characteristics of composite reinforced stiffened panels --- load tests to failure
(NLR-TR-78025-U) N79-32290

STIFFNESS MATRIX
An efficient method for solving stiff transient field problems arising from FEM formulations
(AD-A070085) N79-32914

STIMULATED EMISSION
Dielectric stimulated arcs in lightning arrestor connectors
(SAND-79-0396C) N79-32480

STOCHASTIC PROCESSES
Survey of modern control and observation theory for disturbed, target following aerospace systems. Part 2: Stochastic performance and spacecraft application
(NLR-TR-78082-U-PT-2) N79-32261
Numerical methods and approximation and modelling problems in stochastic control theory
(AD-A070038) N79-32898
Queues and stores with nonhomogeneous input
(AD-A069550) N79-32900
Comments on a simple proof of the separation theorem for linear stochastic systems with time delays
(AD-A070272) N79-32946
A comparison of sampling plans for Bayesian estimation of a Poisson process rate
(AD-A070215) N79-32948
Practical control algorithms for nonlinear stochastic systems and investigations of nonlinear filters
(AD-A069980) N79-32953

STOCKPILING
Strategic petroleum reserve
(DOE/TIC-10107) N79-32617

STOKES THEOREM (VECTOR CALCULUS)
Integral kernels and approximation on totally real submanifolds of vector space exponent n
(CTH-MATH-1979-1) N79-32930

STORAGE RINGS (PARTICLE ACCELERATORS)
PEP laser surveying system
(LBL-8412) N79-32545

STORAGE STABILITY
Long-term storage of irradiated CANDU fuel under water
(AECL-6313) N79-32999

STORAGE TANKS
Methodology investigation. Moisture and temperature conditions in storage containers in humid environments
(AD-A071134) N79-32561

STRATIFICATION
Stratified thermal storage in residential Solar energy applications
(COO-4523-1) N79-32682

STRATOSPHERE
Aeronomical models of the stratosphere
(AERONOMICA-ACTA-A-202-1979)
N79-32765
Spectral lineshape calculation for a stratospheric emission model
(NPL-QU-50) N79-32780

STRESS (BIOLOGY)
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
(E79-10271) N79-32605
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions --- Rio Grande Valley, Texas
(E79-10280) N79-32606

STRESS ANALYSIS
Boundary layer effects in composite laminates
N79-32271
Flow and failure behavior of fiber-reinforced epoxy matrix polymeric composites
(UCRL-13895) N79-32279
Electromagnetic field and mechanical stress analysis code. Appendix A: Preliminary conceptual design study of the riggatron approach to fusion power
(DOE/TIC-4068-T2-APP-A) N79-32443
Growth characteristics of a through crack in a plate of finite thickness
N79-32568
Contact stresses on bodies with arbitrary geometry
N79-32569
A critical review of relevant literature --- relating to stress analysis of pressure vessels
N79-32578
Apex singularities for corner cracks under opening, sliding, and tearing modes
(AD-A070200) N79-32587
X-ray diffraction measurements of crack tip stresses as a crack advances through a single overload affected zone
(AD-A070193) N79-32588
Temperature based stress analysis of notched members
(AD-A070372) N79-32589
Stress analysis of cylindrical pressure vessels with closely spaced nozzles by the finite-element method. Volume 2: Vessels with two nozzles under external force and moment loadings
(NUREG-CR-0132) N79-32590
Limiting mechanisms of dislocation motion in ice
N79-32602

STRESS CONCENTRATION
Stress concentration factors in spheres with radial flush nozzles
(CRIF-MT-129) N79-32601

STRESS CORROSION CRACKING
Heat treatment studies of aluminum alloy type 7050 forgings. Corroded-specimen fatigue tests and SSC propagation tests
(NLR-TR-77124-U) N79-32351
Fracture mechanics and ambient temperature sustained load fracture
(NLR-MP-78008-U) N79-32595

STRESS CYCLES
The axial loading corrosion fatigue properties of 25mm thick high and low strength X166 plate (DTD 5120 and DTD 5130)
(RAE-TR-78114) N79-32600

STRESS TENSORS
Three-dimensional strength characterization of thick composite laminates
N79-32275

STRESS WAVES
Measurement system for large motions --- response of geologic media to stress waves from underground nuclear tests
(EGG-1183-1634) N79-32777

STRESS-STRAIN DIAGRAMS
A rheo-optical study of the stress-induced crystallization of poly(ethylene terephthalate)
N79-32353

STRESS-STRAIN RELATIONSHIPS
Three-dimensional strength characterization of thick composite laminates
N79-32275

STRESSES
Contact stresses on bodies with arbitrary geometry
N79-32569
Temperature based stress analysis of notched members
(AD-A070372) N79-32589

STRUCTURAL ANALYSIS
Modal interpolation program, L215 (INTERP). Volume 1: Engineering and usage
(NASA-CR-2847) N79-32164
Research Workshop on Mechanics of Composite Materials
N79-32267
Mathematical modeling and micromechanics of fiber-reinforced bimodulus composite materials
(AD-A071389) N79-32278
Static and dynamic finite deformations of viscoelastic solids and structures
N79-32567
Numerical analysis of pressure vessels using various shell theories: Introduction
N79-32577
Numerical analysis --- analysis methods for pressure vessesl
N79-32580
Numerical results --- analysis of pressure vessels using various shell theories
N79-32581
Numerical analysis of pressure vessels using various shell theories: Discussions and conclusions
N79-32582
Structural model testing for prestressed concrete pressure vessels: A study of grouted vs nongrouted posttensioned prestressing tendon systems
(ORNL/TM-6478) N79-32592

STRUCTURAL DESIGN
Construction problems for high Reynolds number wind tunnel models
(ONERA-NT-1978-6) N79-32224
Effect of environmental parameters on habitat structural weight and cost
N79-32228
The initial lunar supply base
N79-32236
Design considerations for the Tandem Junction Solar Cell
N79-32651
Solar Heating And Cooling Of Buildings (SHACOB): Requirements definition and impact analysis
(EPRI-ER-808-SY) N79-32687
Structural optimization of sheet molding compound line focusing collectors
(SAND-79-0215C) N79-32710
Application of a structured decision process for proper inclusion of human resources in the design of a power unit support stand
(AD-A069978) N79-32840
Control system designs for the shuttle infrared telescope facility
(NASA-CR-162321) N79-33121

STRUCTURAL DESIGN CRITERIA
HiMAT structural development design methodology --- aeroelastic tailoring of the canard and wing box and distributed load tests
(NASA-CR-144886) N79-32197

STRUCTURAL ENGINEERING
Selecting aluminum alloys to resist failure by fracture mechanisms
(ALCOA-57-77-24-REV) N79-32323
The 500 MeV, 10% d.f. linear accelerator (MEA) under construction at Amsterdam
(REPT-79/1) N79-33008

STRUCTURAL MEMBERS
Effect of element density on the NASTRAN calculated mechanical and thermal stresses of a spar
(NASA-TM-72868) N79-32151

STRUCTURAL VIBRATION
Dynamic analysis of cylindrical shells with cutouts and cracks
N79-32572

STRUCTURAL WEIGHT
Effect of environmental parameters on habitat structural weight and cost
N79-32228

SUBROUTINE LIBRARIES (COMPUTERS)
A brief guide to NPL Algorithms Library, 1979
(NPL-CSU-3/79) N79-32884

SUBROUTINES
Brief instructions for using the Sandia Mathematical Subroutine Library (version 7.2)
(SAND-77-1441) N79-32924

SUBSONIC FLOW
An experimental evaluation of a laser velocimeter by the study of turbulence in a plane free jet at high subsonic velocities
[AD-A070102] N79-32502
SUBSONIC SPEED
A program to compute three-dimensional subsonic unsteady aerodynamic characteristics using the doublet lattic method, L216 [DUBFLX]. Volume 1: Engineering and usage
[NASA-CR-2849] N79-32163
SUCTION
Effect of compressibility, suction, and heat transfer on the nonparallel stability of boundary-layer flows
N79-32494
SUGAR CANE
Sugar crops as a source of fuels. Volume 2: Processing and conversion research
[TID-29400-2] N79-32389
SULFATES
Guide for estimating dry deposition velocities of sulfur over the eastern United States and surrounding regions
[ANL/RER-79-2] N79-32750
SULFITES
Kinetics and reaction products of aerobic pyrrhotite [FeS] hydrolysis at ambient temperatures
[METC/RI-79/3] N79-32311
SULFUR DIOXIDES
Guide for estimating dry deposition velocities of sulfur over the eastern United States and surrounding regions
[ANL/RER-79-2] N79-32750
SULFUR FLUORIDES
Investigation of electron attachment in polyatomic molecules --- sulfur hexafluoride, molybdenum hexafluoride, and tungsten oxide vapor
[AD-A070069] N79-32985
SUPERCONDUCTING POWER TRANSMISSION
Thermoelastic analysis of a superconducting cable
[LA-7465-MS] N79-32477
Energy losses in a flat transposed cable --- superconducting cable
[LA-7635-MS] N79-32481
SUPERCRITICAL FLOW
Water-cooled turbine blade technology study --- for gas turbines
[PB-295892/4] N79-32215
SUPERCRITICAL WINGS
Aerodynamic data for three supercritical airfoils: RAE[NPL]9515 and 9530, and RAE 9550. Parts 1 and 2
[ARC-R/M-3820] N79-32178
SUPERNOVAE
Nucleosynthesis in supernovae and the origin of isotopic heterogeneity in the early solar system
N79-33126
SUPERSONIC BOUNDARY LAYERS
Pressure gradient effects on supersonic boundary layer turbulence --- wind tunnel test
[AD-A070254] N79-32167
SUPERSONIC CRUISE AIRCRAFT RESEARCH
Effect of outboard vertical-fin position and orientation on the low-speed aerodynamic performance of highly swept wings --- supersonic cruise aircraft research
[NASA-TM-80142] N79-32158
SUPERSONIC FLIGHT
Seismic determination of impact times of supersonic projectiles
[SAND-78-1077] N79-32775
SUPERSONIC WIND TUNNELS
Construction problems for high Reynolds number wind tunnel models
[ONERA-NT-1978-6] N79-32224
SUPPLYING
Assessment of potential US petroleum supply shortfalls, 1978 - 1980
[DOE/EIA-0102/13] N79-32619
Energy Emergency Management Information System [EEMIS]: Program plan
[DOE/EIA-0135] N79-32723
SUPPORTS
Microprocessor-controlled autonomous sun-following mount for solar photovoltaic energy planning
[COO-4094-34] N79-32702
SUPPRESSORS
Metal grid angular filters for sidelobe suppression
[AD-A070111] N79-32424
SURFACE ENERGY
Study of the inhomogeneous electron gas at surfaces --- for investigation many body problems and density profiles at surfaces
N79-33069
SURFACE FINISHING
Ion bombardment of materials containing alkali metals of alkaline earths
[AD-A070284] N79-32541
SURFACE LAYERS
Development of an industrial process for the production of indium oxide layers for the improvement of the K-values of insulating glass panes
[BMFT-FB-T-78-34] N79-32282
SURFACE PROPERTIES
NDE method for characterizing anodized Al surfaces
[AD-A070936] N79-32337
Contact stresses on bodies with arbitrary geometry
N79-32569
Effects of interface conductivity on electric logging in western gas sands: A literature review
[BETC/IC-79/2] N79-32621
SURFACE TEMPERATURE
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model --- Los Angeles, California and St. Louis, Missouri
[E79-10269] N79-32604
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions --- Rio Grande Valley, Texas
[E79-10280] N79-32606
Geologic application of thermal-inertia mapping from satellite --- Powder River Basin, Arizona and Wyoming
[E79-10282] N79-32607
Satellite monitoring of sea surface pollution --- North Sea
[E79-10287] N79-32611
SURVEILLANCE RADAR
Numerical studies of conversion and transformation in a surveillance system employing a multitude of radars, part 2 --- advanced air traffic control services
[AD-A072086] N79-32415
Numerical studies of conversion and transformation in a surveillance system employing a multitude of radars, part 1 --- advanced air traffic control services
[AD-A072085] N79-32416
SURVEYS
PEP laser surveying system
[LBL-8412] N79-32545
Stirling laboratory research engine survey report
[NASA-CR-162304] N79-32636
Survey of biomedical and environmental data bases, models, and integrated computer systems at Argonne National Laboratory
[ANL/ES-65] N79-32745
On-board transit origin-destination survey data: Expanding their use via on-line data access and analysis
[PB-294967/5] N79-33114
SWEDEN
Swedish earthquakes and acceleration probabilities
[FOA-C-20295-E4] N79-32782
SWEPTBACK WINGS
Calculation of the flow around a swept wing, taking into account the effect of the three-dimensional boundary layer. Part 2: Wing with laminar boundary layer on the lower surface
[NLR-TR-77066-U] N79-32176
SYMBOLS
Cockpit displays of traffic information: Airline pilots opinions about content, symbology, and format
[NASA-TM-78601] N79-32185
SYNCHROCYCLOTRONS
Meson factories --- and their applications
[LA-UR-79-1236] N79-32989
SYNCHRONISM
Synchronization of clocks in the 100 ps range
[ONERA-NT-1978-1] N79-32968
SYNTHANE
Thermodynamic-economic analysis of the synthane process
[COO-4589-1] N79-32379
SYNTHETIC FUELS
Recent developments in coal liquefaction in the United States --- conferences
[CONF-790213-5] N79-32383
Advanced synfuel production with fusion
[BNL-26130] N79-32388
Water related environmental effects in fuel conversion. 1: Summary volume --- water requirements for synthetic fuel technologies
[FE-2445-1-VOL-1] N79-32747
SYSTEM EFFECTIVENESS
Meteorological rocket network system reliability
[AD-A070187] N79-32808
SYSTEMS ANALYSIS
Systems engineering overview for regenerative life-support systems applicable to space habitats
N79-32226
Research planning criteria for regenerative life-support systems applicable to space habitats
N79-32227
Modelling and system identification for the inphase/quadrature process
N79-32407
Technical assistance for law-enforcement communications: Case study report two
[NASA-CR-162294] N79-32410
Theoretical and computational aspects of reliability indices for large scale systems
N79-32558
A preliminary assessment of small steam Rankine and Brayton point-focusing solar modules
[NASA-CR-162302] N79-32632
A review of Air Force high efficiency cascaded multiple bandgap solar cell research and development
N79-32670
Evaluation of a large nonconvective solar pond
[MLM-2606[OP]] N79-32680
Stratified thermal storage in residential Solar energy applications
[COO-4523-1] N79-32682
Systems analysis of solar thermal power systems. Report on task 1: Determination and characterization of solar thermal conversion options
[PNL-2693] N79-32692
Aviation automated weather observation system [AV-AWOS]
[AD-A072119] N79-32805
Phased models for evaluating the performability of computing systems
[NASA-CR-162317] N79-32876
Software reliability determination and prediction
[AD-A069976] N79-32880
On systems of toda type
[AD-A070216] N79-32923
SYSTEMS ENGINEERING
Review of design and operational characteristics of the 0.3-meter transonic cryogenic tunnel
[NASA-TM-80123] N79-32159
Random harmonic analysis program, L221 [TEV156]. Volume 2: Supplemental system design and maintenenace document
[NASA-CR-2858] N79-32162
A program to compute three-dimensional subsonic unsteady aerodynamic characteristics using the doublet lattic method, L216 [DUBFLX]. Volume 1: Engineering and usage
[NASA-CR-2849] N79-32163
Space resources and space settlements
[NASA-SP-428] N79-32225
Systems engineering overview for regenerative life-support systems applicable to space habitats
N79-32226
Effect of environmental parameters on habitat structural weight and cost
N79-32228
Mass drivers. 1: Electrical design
N79-32230
Mass drivers. 3: Engineering
N79-32232
Magnetosphere sounding rocket program. A substorm phenomena payload. Report on system design, integration, testing, and flight
[BMFT-FB-W-78-35] N79-32247
Robust optimal systems in radar and communications
N79-32406
Device model for FETSIM circuit simulation program
[NASA-CR-150321] N79-32465
Digital recording using hologram arrays: Optical design for an experimental 100 Mbit/s recorder
[BBC-RD-1979/14] N79-32523
A multichannel digital sound recorder
[BBC-RD-1979/15] N79-32524
Design fabrication and installation of a yaw measuring device
[NASA-CR-161300] N79-32526
PEP laser surveying system
[LBL-8412] N79-32545
Combined photovoltaic/thermal system studies
[SAND-78-7031] N79-32691
Thermal energy storage for advanced solar central receiver power systems
[SAND-78-8221] N79-32694
Microprocessor-controlled autonomous sun-following mount for solar photovoltaic energy planning
[COO-4094-34] N79-32702
Measurement system for large motions --- response of geologic media to stress waves from underground nuclear tests
[EGG-1183-1634] N79-32777
Application of a structured decision process for proper inclusion of human resources in the design of a power unit support stand
[AD-A069978] N79-32840
Quantitative synthesis of multiple loop feedback systems with large uncertainty
[AD-A070273] N79-32896
Definition and conceptual design of a small fusion reactor
[EPRI-ER-1045] N79-33004
Design of IRSS projectors
[AD-A070898] N79-33020
Astronomical spectroscopy through real time computer control of photodiode array detectors
N79-33120
SYSTEMS MANAGEMENT
Transportation systems management element
[PB-295349/5] N79-33111
SYSTEMS STABILITY
Stability of density waves in two-phase flow systems
N79-32496

T

TABLES [DATA]
Rude Skov Geophysical Observatory: Magnetic results, 1977
[ISBN-87-7478-161-8] N79-32789
Summaries of weather observatories at weather stations in Greenland from 1966 to 1970
[ISBN-87-7478-156-1] N79-32813

Solar-geophysical data number 415, March 1979. Part 1: Prompt reports, data for February 1979, January 1979
[PB-296275/1] N79-33146
TAPE RECORDERS
A multichannel digital sound recorder
[BBC-RD-1979/15] N79-32524
TAPERING
Optimum axial flow taper in a countercurrent gas centrifuge
[K/OA-4445] N79-32504
TARGET ACQUISITION
Distributed sensor networks
[AD-A070455] N79-32438
Prediction of the recognition of real objects as a function of photometric and geometric characteristics
[AD-A071118] N79-32614
TARGET RECOGNITION
Numerical studies of conversion and transformation in a surveillance system employing a multitude of radars, part 2 --- advanced air traffic control services
[AD-A072086] N79-32415
Numerical studies of conversion and transformation in a surveillance system employing a multitude of radars, part 1 --- advanced air traffic control services
[AD-A072085] N79-32416
TASK COMPLEXITY
Performance and workload analysis of inflight helicopter missions
[NLR-MP-77013-U] N79-32834
TEARING
Apex singularities for corner cracks under opening, sliding, and tearing modes
[AD-A070200] N79-32587
TECHNICAL WRITING
Journal in scientific communication: The roles of authors, publishers, libraries and readers in a vital system
[PB-296263/7] N79-33108
TECHNOLOGICAL FORECASTING
Technology trends and maintenance workload requirements for the A-7, F-4, and F-14 aircraft
[AD-A070036] N79-32153
TECHNOLOGY ASSESSMENT
Research planning criteria for regenerative life-support systems applicable to space habitats
N79-32227
Military satellite communications, history and status as of 1974
[NRL-TR-74173-U] N79-32254
PNP: planar transistor technology
[BMFT-FB-T-78-20] N79-32483
Modern technology for semiconductor devices
[BMFT-FB-T-78-21] N79-32484
New functionally integrated circuits
[BMFT-FB-T-78-37] N79-32485
LSA project technology development update
[NASA-CR-162301] N79-32633
Silicon solar cells for space use: Present performance and trends
N79-32654
Decentralized solar energy technology assessment program: Research plan
[ORNL/TM-6913] N79-32677
Economic and demographic issues related to deployment of the Satellite Power System [SPS]
[NASA-CR-158886] N79-32699
Status review of the technology assessment of solar energy program
[LA-UR-79-1369] N79-32714
Theoretical investigations of experimental gravitation --- outlining applications of resonant sensing systems to gravitational wave astronomy
N79-32761
Nuclear safeguards research and development
[LA-7616-PR] N79-32996
TECHNOLOGY TRANSFER
Journal in scientific communication: The roles of authors, publishers, libraries and readers in a vital system
[PB-296263/7] N79-33108
TECHNOLOGY UTILIZATION
Telehealth handbook: A guide to telecommunications technology for rural health care
[MTR-7581] N79-32413
Communication application of adaptive arrays
[AD-A070181] N79-32431
Advanced training and research on satellite remote sensing techniques and applications in the United Kingdom and the United States, 1 October 1977 to 30 September 1978
[AGLT/RSU-SERIES-2/79] N79-32622
Stratified thermal storage in residential Solar energy applications
[COO-4523-1] N79-32682
Meteorological data for solar energy applications
N79-32733
Published patent applications and patents resulting from German government sponsored research and development
[BMFT-FB-T-78-31] N79-33151
TELECOMMUNICATION
Modulation-delay equalisation applied to common-frequency h.f. circuits: An assessment of the likely improvement
[BBC-RD-1979/13] N79-32404
Technical assistance for law-enforcement communications: Case study report two
[NASA-CR-162294] N79-32410
Telehealth handbook: A guide to telecommunications technology for rural health care
[MTR-7581] N79-32413
Communication application of adaptive arrays
[AD-A070181] N79-32431
The radio spectrum international allocation and regulation
[AD-A070110] N79-32437
Simulation of communications systems for TV transmission, exchange of radio programs, and long-distance telephony
[BMFT-FB-W-78-27] N79-32445
Optimization of future telecommunication network structures
[BMFT-FB-T-78-55] N79-32448
Microwave communication, volume 2. A bibliography with abstracts
[NTIS/PS-79/0525/0] N79-32454
TELECONFERENCING
The conclave computer teleconferencing system
[NPL-COM-107] N79-32446
Evaluation of echo suppression in video teleconferencing via the communications technology satellite
[PB-294965/9] N79-32455
TELEMETRY
Design and development of a telemetry logging system
[AD-A070310] N79-32258
Design of an improved air quality telemetry system
[PB-296076/3] N79-32259
TEMPER (METALLURGY)
The effects of composition and carbide precipitation of temper embrittlement of 2 1/4 Cr-1 Mo steels
N79-32322
TEMPERATURE DEPENDENCE
Temperature based stress analysis of notched members
[AD-A070372] N79-32589
Characterization of solar cells for space applications. Volume 8: Electrical characteristics of Spectrolab BSF, BSR, textured 290-micron solar cells [K7] as a function of intensity, temperature and irradiation
[NASA-CR-162290] N79-32630
Temperature and intensity dependence of the performance of an electron-irradiated (AlGa)As/GaAs solar cell
N79-32665
Efficiency of tandem solar cell systems as function of temperature and solar energy concentration ratio
N79-32671
TEMPERATURE DISTRIBUTION
Some evolution and stability trends deduced from energy and water vapor balance models
[AERONOMICA-ACTA-A-201-1979]
N79-32795
TEMPERATURE EFFECTS
Prevention of early pavement deterioration --- due to moisture in asphalt mixes, temperature susceptability, and transverse cracking
[PB-296337/9] N79-32402
TEMPERATURE GRADIENTS
Nonparallel stability of two-dimensional nonuniformly heated boundary-layer flows
[NASA-CR-162309] N79-32499
TEMPERATURE PROFILES
Temperature profile in Li/So2 cells during discharge
[AD-A070378] N79-32676
TENDONS
Structural model testing for prestressed concrete pressure vessels: A study of grouted vs nongrouted posttensioned prestressing endon systems
[ORNL/TM-6478] N79-32592
TENSILE STRENGTH
Structure-property relations of elastomeric ABA triblock copolymers
N79-32355
TENSILE TESTS
Investigation of the length dependency of carbon fibers and the related unidirectional composite strength --- fracture load tests
[NLR-TR-78050-U] N79-32291
Kevlar properties investigation development of Kevlar tensile test methods
[AD-A071405] N79-32363
The axial loading corrosion fatigue properties of 25mm thick high and low strength X166 plate [DTD 5120 and DTD 5130]
[RAE-TR-78114] N79-32600
TERBIUM
Ultrasonic generation in thin films of TbFe2
N79-33073
TERNARY SYSTEMS
Metal hydride technology --- hydrogen bonding with intermetallics
[BNL-26047] N79-32387
TERRAIN ANALYSIS
Optimal terrain-aided navigation systems
[SAND-78-0874C] N79-32190
The mapping of Martian soil density. A comparison of albedo, topography, and geology
[PR-417] N79-33142
TERRESTRIAL RADIATION
Earth Radiation Budget Science, 1978 --- conferences
[NASA-CP-2100] N79-32797
Earth Radiation Budget Science, 1978. 1: Introduction --- to obtain radiation budget measurements by satellite observation
N79-32798
Climate modeling --- for use in understanding earth's radiation budget
N79-32799
Climate diagnostics --- using radiation and meteorological data for diagnosing climatic fluctuations
N79-32800
Radiation modeling --- solar and terrestrial radiation
N79-32801
Radiation variability and correlation studies --- earth-atmosphere system
N79-32802
Cloudiness and the radiation budget
N79-32803
TEST FACILITIES
Solar thermal test facilities users association
[SERI/PR-13-154] N79-32688
Small-scale solar simulator for indoor testing of collector modules and materials
[LA-UR-79-1335] N79-32716
TEST STANDS
Standalone engine simulator [SAES], Engine Dynamics simulator [EDS] Xerox Sigma 5 interface hardware manual
[NASA-CR-161301] N79-32213
TEXAS
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
[E79-10271] N79-32605
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions --- Rio Grande Valley, Texas
[E79-10280] N79-32606
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data
[E79-10283] N79-32608
THALLIUM ISOTOPES
The absolute isotopic abundance and atomic weight of thallium
N79-32295
THEMATIC MAPPING
Georgia from space: An explanation of the NASA LANDSAT 1 satellite image color mosaic of the state of Georgia
[CIRC-787] N79-32613
THEOREM PROVING
Oscillation theory of systems of ordinary differential equations
N79-32901
A new proof of a Muentz-type theorem of Korevarr and Dixon
[CTH-MATH-1979-7] N79-32934
Comments on a simple proof of the separation theorem for linear stochastic systems with time delays
[AD-A070272] N79-32946
THEORETICAL PHYSICS
Theoretical investigations of experimental gravitation --- outlining applications of resonant sensing systems to gravitational wave astronomy
N79-32761
THERMAL CONDUCTIVITY
Determination of the thermal conductivity of carbon fiber reinforced plastic sheet material
[NLR-TR-77113-U] N79-32284
Thermal conductance measurement of honeycomb sandwich panels with carbon fiber reinforced plastic face sheets
[NLR-TR-78081-U] N79-32285
THERMAL DIFFUSION
Cross-field electron heat transport due to high frequency electrostatic waves
[IPPJ-405] N79-33029
THERMAL ENERGY
Energy extraction operations: Some preliminary results --- thermal energy from granitic rocks by water injection
[LA-UR-79-679] N79-32678
Solar thermal test facilities users association
[SERI/PR-13-154] N79-32688
Combined photovoltaic/thermal system studies
[SAND-78-7031] N79-32691
Systems analysis of solar thermal power systems. Report on task 1: Determination and characterization of solar thermal conversion options
[PNL-2693] N79-32692
Recent advances in thermochemical energy storage and transport
[SAND-78-8505] N79-32720

Meteorological Effects of Thermal Energy Releases [METER] program
[ORNL/TM-6248] N79-32812

THERMAL INSTABILITY
Linear stability of self-similar flow: 5. Convective instability in bounded uniform self-gravitating spheres
[AD-A070709] N79-32508

THERMAL INSULATION
Development of an industrial process for the production of indium oxide layers for the improvement of the K-values of insulating glass panes
[BMFT-FB-T-78-34] N79-32282
Effect of 25 cycles of launch pad exposure and simulated mission heating on space shuttle reusable surface insulation coated with reaction cured glass
[NASA-TM-80160] N79-32358

THERMAL MAPPING
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model --- Los Angeles, California and St. Louis, Missouri
[E79-10269] N79-32604
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions --- Rio Grande Valley, Texas
[E79-10280] N79-32606
Geologic application of thermal-inertia mapping from satellite --- Powder River Basin, Arizona and Wyoming
[E79-10282] N79-32607

THERMAL RADIATION
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico
[E79-10271] N79-32605

THERMAL STABILITY
Thermal stability of natural convection in slots and flow down an inclined heated plane
N79-32497
Stability of the lanthanide hydrides
[LA-7602-MS] N79-32991
Development of techniques for the design of athermalized optical systems --- for focusing and boresighting using wave theory
[AD-A070257] N79-33016

THERMAL STRESSES
Effect of element density on the NASTRAN calculated mechanical and thermal stresses of a spar
[NASA-TM-72868] N79-32151

THERMOCHEMISTRY
Mission analysis for the federal fuels from biomass program. Volume 4: Thermochemical conversion of biomass to fuels and chemicals
[SAN-0115-T3] N79-32384
Recent advances in thermochemical energy storage and transport
[SAND-78-8505] N79-32720

THERMODYNAMIC EFFICIENCY
Thermodynamic-economic analysis of the synthane process
[COO-4589-1] N79-32379

THERMODYNAMIC PROPERTIES
Extension of the heat pulse technique to the minute heat capacities of thin films at low temperatures
N79-32491
A theoretical and experimental study of the thermal properties of xenon adsorbed on graphite
N79-33071
Correlation between the kinetic and thermodynamic properties of interstitial solid solutions
N79-33077
The role of structure in determining the thermodynamic properties of homogeneous fluid mixtures --- using radial and probability distribution functions
N79-33094
Thermodynamic and transport properties of isobutane: A survey of available data
[COO-4051-35] N79-33096

THERMODYNAMICS
A bulk model of the atmospheric planetary boundary layer
[DM-28] N79-32790
Statistical thermodynamics of sorption in molecular sieves
N79-33095

THERMOELASTICITY
Thermoelastic analysis of a superconducting cable
[LA-7465-MS] N79-32477

THERMOLUMINESCENCE
Standard procedure for use of thermoluminescence dosimetry in radiation-hardness testing of electronic devices
[AD-A071172] N79-32474

THERMONUCLEAR EXPLOSIONS
Long term effect on the ozone layer of nitrogen oxides produced by thermonuclear explosions in the atmosphere
[AERONOMICA-ACTA-A-198-1979] N79-32763

THERMOPHYSICAL PROPERTIES
Aviation turbine fuels, 1978 --- thermophysical properties
[BETC/PPS 79/2] N79-32381

THERMOSPHERE
Comparisons between various semi-empirical thermospheric models of the terrestrial atmosphere
[AERONOMICA-ACTA-A-199-1979] N79-32764
Temperature, molecular nitrogen concentration and turbulence in the lower thermosphere inferred from incoherent scatter data
[AERONOMICA-ACTA-A-204-1979] N79-32767

THESAURI
An automated thesaurus construction based on a distance measurement between keywords
N79-33100

THIAMINE
Studies in electrochemistry. 1: Microprocessor controlled electrochemistry. 2: Thiamine electrochemical oxidation reactions
N79-32301

THICKNESS
Three-dimensional strength characterization of thick composite laminates
N79-32275
The effect of sheet thickness on flight simulation fatigue crack propagation in 2024-T3, 7475-T761, and mill annealed Ti-6Al-4V
[NLR-MP-77024-U] N79-32345
Effect of sheet metal thickness on crack propagation --- Duralumin
[ISD-240] N79-32593

THICKNESS RATIO
The design and aerodynamic characteristics of an 18% thick shock-free airfoil [NLR 7501]
[NLR-MP-78016-U] N79-32180
Thin cells for space
N79-32652
CO2 laser annealing of 50-microns-thick silicon solar cells
N79-32659

THIN FILMS
Fourier transform infrared analysis of plasma polymerized 2-vinylpyridine thin films
[SAND-78-0761C] N79-32366
Extension of the heat pulse technique to the minute heat capacities of thin films at low temperatures
N79-32491
Cadmium sulfide-copper sulfide heterojunction cell research
[SAN-1459-3] N79-32701
Investigation of low cost solar cells based on Cu2O --- MIS solar cell theory
[PB-295888/2] N79-32737
Electrical properties of thin GaAs films deposited by sputtering
[AD-A070017] N79-33081
Orientation of crystalline overlayers on amorphous substrates by artificially produced surface relief structures
[AD-A071168] N79-33091

THIN WINGS
Prediction of aerodynamic forces on a circular cylinder and a thin airfoil in a transonic airstream by the finite element method
[AD-A070663] N79-32171

THORIUM COMPOUNDS
Experimental studies of valence instabilities
[AD-A070352] N79-32306

THREE DIMENSIONAL BOUNDARY LAYER
Calculation of the flow around a swept wing, taking into account the effect of the three-dimensional boundary layer. Part 2: Wing with laminar boundary layer on the lower surface
[NLR-TR-77066-U] N79-32176

THREE DIMENSIONAL COMPOSITES
Three-dimensional laminate plates with through and part-through cracks
N79-32276

THREE DIMENSIONAL FLOW
The oblique wing as a lifting-line problem in transonic flow
[AD-A070232] N79-32166
Theoretical studies of three dimensional transonic flow through a compressor blade row
[AD-A071020] N79-32172
The performance of a vectorized 3-D Navier-Stokes code on the CRAY-2 computer
[AD-A071137] N79-32510
Rapid calculation of three-dimensional flows in flush inlets
[AD-A069585] N79-32512
Development of a viscous theory of three-dimensional flow in highly-loaded axial turbomachines
[AD-A071049] N79-32554

THRUST CHAMBERS
Development of sputtered techniques for thrust chambers
[NASA-CR-159637] N79-32326

TIDE POWERED GENERATORS
Renewable ocean energy sources. Part 2: Working papers: ocean winds, currents, waves, tides and salinity gradients
[PB-295876/7] N79-32735

TIEBOLTS
Behavior of composite bolted joints at elevated temperature
[NASA-CR-159137] N79-32574

TIME DEPENDENCE
Time history solution program, L225 [TEV126]. Volume 1: Engineering and usage
[NASA-CR-2859] N79-32161
Time-dependent FEM solution of the incompressible Navier-Stokes equations in two and three-dimensions
[UCRL-81323] N79-32517
On coupling of continuous time renewal processes
[CTH-MATH-1979-11] N79-32937

TIME LAG
Comments on a simple proof of the separation theorem for linear stochastic systems with time delays
[AD-A070272] N79-32946

TIME MEASUREMENT
Synchronization of clocks in the 100 ps range
[ONERA-NT-1978-1] N79-32968

TIME RESPONSE
Time history solution program, L225 [TEV126]. Volume 1: Engineering and usage
[NASA-CR-2859] N79-32161

TIME SERIES ANALYSIS
Discrete-time spectral estimation of continuous-time processes: The orthogonal series method spectral estimation by orthogonal series
[AD-A070641] N79-32952

TIME SHARING
Update synchronization in multiaccess database systems
N79-32845

TITANIUM
Passivation of the pyrotechnic fuels titanium and titanium hydride in oxidative environments
[SAND-78-0264C] N79-32378

TITANIUM ALLOYS
Collected engineering data sheets, Air Force data sheet program --- airframe materials
[AD-A070665] N79-32201
Environmental fatigue crack propagation in metal/composite laminates
[NLR-MP-78027-U] N79-32283
Fatigue behavior of TiNi alloy
N79-32319
Low cycle fatigue behavior of Ti-Mn alloys
N79-32321
Phase transformations in Ti alloys: A review of recent developments
[AD-A070906] N79-32330
Fracture toughness of Widmanstatten colonies of an alpha-beta titanium alloy
[AD-A070745] N79-32331
Weldability of formable sheet titanium alloy Ti-15V-3Cr-3Al-3Sn
[AD-A070747] N79-32332
Cast titanium compressor casting
[AD-A071051] N79-32335
The effect of sheet thickness on flight simulation fatigue crack propagation in 2024-T3, 7475-T761, and mill annealed Ti-6Al-4V
[NLR-MP-77024-U] N79-32345
Fatigue testing of titanium 6Al4V
[FFA-TN-HU-1993] N79-32348
Fracture along planar slip bands
[AD-A070788] N79-32585

TITANIUM BORIDES
Hydrogen retention and release in first-wall coatings for Tokamaks
[SAND-78-2128C] N79-33055

TOKAMAK DEVICES
Preliminary experiment of neutral beam injection heating in JIPP T-2 device
[IPPJ-392] N79-33027
Hydrogen retention and release in first-wall coatings for Tokamaks
[SAND-78-2128C] N79-33055
Damage of metal surfaces by a hot dense deuterium plasma --- using unipolar arcing for the study of fusion reactor materials
[COO-4393-03] N79-33057

TOMOGRAPHY
Simulated neutron tomography for nondestructive assays
[LA-UR-79-938] N79-32565

TOROIDAL PLASMAS
Compression of toroidal plasma by imploding plasma-liner
[IPPJ-408] N79-33032
Electron-cyclotron heating of toroidal plasma with emphasis on results from the ELMO Bumpy Torus [EBT]
[ORNL/TM-6703] N79-33052

TORSION
The solution of the axisymmetric elastic-plastic torsion of a shaft using variational inequalities
[AD-A070207] N79-32583
Torsion theories with the bounded splitting property --- limited to commutative rings
N79-32963

TORSIONAL STRESS
Torsion tests on steels used in the manufacture of high pressure vessels
[NPL-CHEM-97] N79-32349
TOUGHNESS
Fracture toughness of Widmanstatten colonies of an alpha-beta titanium alloy
[AD-A070745] N79-32331
TOXIC HAZARDS
Experience with fluorine and its safe use as a propellant
[NASA-CR-162296] N79-32369
Avoiding future health problems related to solar energy [photovoltaic] technology
[BNL-25935] N79-32718
TOXICITY
Mechanisms of oxygen toxicity at the cellular level
[AD-A070026] N79-32823
TRACKING [POSITION]
Survey of modern control and observation theory for disturbed, target following aerospace systems. Part 2: Stochastic performance and spacecraft application
[NLR-TR-78082-U-PT-2] N79-32261
TRACKING FILTERS
Calculation of the correlation region size for use with alpha-beta tracking filters
[AD-A072083] N79-32414
TRACKING RADAR
Calculation of the correlation region size for use with alpha-beta tracking filters
[AD-A072083] N79-32414
TRAFFIC
Heavy traffic results for single server queues with dependent EARMA service and interarrival times
[AD-A070086] N79-32895
Characteristics of urban transportation demand; appendix
[PB-294989/9] N79-33112
TRAJECTORY ANALYSIS
Round-trip missions to low delta-V asteroids and implications for material retrieval N79-32233
TRAJECTORY OPTIMIZATION
On the use of spline functions and collocation in a trajectory optimization algorithm based on mathematical programming
[NLR-TR-78016-U] N79-32926
TRANSFER FUNCTIONS
Direct solution of the equation of transfer using frequency and angle-averaged photon escape probabilities
[AD-A070545] N79-33045
TRANSITION TEMPERATURE
An investigation of factors affecting the semiconductor-to-metal transition of V[1-x]W[x]O[2] N79-33076
TRANSMISSION EFFICIENCY
Electromagnetic shielding formulas
[TRITA-EPP-79-01] N79-32449
Description of STIDAS 2-c [Speech Transmission Index Device using Artificial Signals]. Part 1: General description
[IZF-1978-19] N79-32450
A physical method for measuring speech-transmission quality
[IZF-1979-1] N79-32451
Multistage depressed collector for dual mode operation --- for travelling wave tubes
[NASA-CASE-LEW-13282-1] N79-32463
TRANSMISSION LINES
A study of the EMP interaction with aircraft over an imperfect ground plane
[AD-A070388] N79-32420
TRANSMISSIVITY
Light emitting diodes. A comparative 10,000 hour service test of light emitting diodes, including 26 variants from 15 manufacturers
[ECR-85] N79-32566
TRANSONIC FLOW
The oblique wing as a lifting-line problem in transonic flow
[AD-A070232] N79-32166
Theoretical studies of three dimensional transonic flow through a compressor blade row
[AD-A071020] N79-32172
The transonic oscillating flap
[AD-A070022] N79-32200
Transonic wing redesign using a generalized fictitious gas method
[AD-A070013] N79-32202
TRANSONIC SPEED
Wind tunnel tests on cambered wings of mild gothic planform. Part 1: Further low speed tests. Part 2: Transonic tests
[ARC-R/M-3827] N79-32179
TRANSONIC WIND TUNNELS
Review of design and operational characteristics of the 0.3-meter transonic cryogenic tunnel
[NASA-TM-80123] N79-32159
An experimental investigation of the acoustic characteristics of a variety of slot baffle configurations for transonic wind tunnel walls
[AD-A070261] N79-32223
TRANSPARENCE
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609
TRANSPORT AIRCRAFT
Aluminum alloys for advanced structural applications in transport aircraft
[NLR-MP-77023-U] N79-32344
TRANSPORT PROPERTIES
Optical versus transport processes in chalcogenide glasses
[AD-A070927] N79-32360
Thermodynamic and transport properties of isobutane: A survey of available data
[COO-4051-35] N79-33096
TRANSPORTATION
Transportation systems center bibliography of technical reports
[PB-296342/9] N79-33107
TRANSPORTATION ENERGY
Comparison of alternate fuels for aircraft --- liquid hydrogen, liquid methane, and synthetic aviation kerosene
[NASA-TM-80155] N79-32637
TRANSPORTER
Paratransit vehicle test and evaluation. Volume 2: Acceleration and interior measurement tests
[PB-295476/6] N79-33109
TRAVELING WAVE TUBES
Multistage depressed collector for dual mode operation --- for travelling wave tubes
[NASA-CASE-LEW-13282-1] N79-32463
TREES [PLANTS]
Feature selection via entropy minimization: An example using LANDSAT satellite data --- forested shorelines near Lake Massaciuccoli between Lucca and Pisa, Italy
[E79-10286] N79-32610
TRITONS
Inelastic electron scattering from Li-7 in the vicinity of the alpha-triton threshold
[AD-A071072] N79-32983
TROPICAL METEOROLOGY
Climate diagnostics --- using radiation and meteorological data for diagnosing climatic fluctuations N79-32800
TROPICAL REGIONS
Methodology investigation. Moisture and temperature conditions in storage containers in humid environments
[AD-A071134] N79-32561
TROPICAL STORMS
Statistical adjustment of dynamical tropical cyclone model track predictions
[AD-A070094] N79-32810
Modification of NMC analyses and prognoses for use in statistical tropical cyclone prediction models
[PB-297190/1] N79-32814
TROPOSPHERE
The effects of the troposphere on Doppler-navigated station positions
[AD-A070184] N79-32188
TTL INTEGRATED CIRCUITS
New functionally integrated circuits
[BMFT-FB-T-78-37] N79-32485
TUBE HEAT EXCHANGERS
Designing tubular heat exchangers using an interactive computer program
[CRIF-MT-131] N79-32521
TUNABLE LASERS
Investigation of broad-band emitters as potential lasing ions between 0.5 and 1.0 micrometers
[AD-A070971] N79-32543
TUNGSTEN OXIDES
Investigation of electron attachment in polyatomic molecules --- sulfur hexafluoride, molybdenum hexafluoride, and tungsten oxide vapor
[AD-A070069] N79-32985
An investigation of factors affecting the semiconductor-to-metal transition of V[1-x]W[x]O[2] N79-33076
TURBIDITY
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609
TURBINE BLADES
Water-cooled turbine blade technology study --- for gas turbines
[PB-295892/4] N79-32215
TURBINE ENGINES
Aviation turbine fuels, 1978 --- thermophysical properties
[BETC/PPS-79/2] N79-32381
TURBINE PUMPS
Evaluation of candidate metals in a simulated space shuttle main engine environment for application as turbine blade dampers
[NASA-CR-161299] N79-32325
TURBINES
Performance tests of the radial outflow reaction turbine for geothermal applications
[UCID-17902] N79-32693
Wind turbines
[ANL/CES/TE-78-9] N79-32711
TURBOCOMPRESSORS
Handling problems resulting from compressor deterioration --- in single engine jet aircraft
[NLR-MP-78019-U] N79-32214
Tunnel 16T performance: Two-and three-stage compressor performance
[AD-A070191] N79-32221
Cast titanium compressor casting
[AD-A071051] N79-32335
TURBOJET ENGINES
Handling problems resulting from compressor deterioration --- in single engine jet aircraft
[NLR-MP-78019-U] N79-32214
TURBOSHAFTS
Cast titanium compressor casting
[AD-A071051] N79-32335
TURBULENCE EFFECTS
Influence of turbulence on hydrocarbon combustion in a stirred combustor
[ONERA-NT-1978-7] N79-32315
TURBULENT BOUNDARY LAYER
Calculation of subsonic normal force and centre of pressure position of bodies of revolution using a slender body theory: Boundary layer method
[WSRL-0093-TR] N79-32160
Pressure gradient effects on supersonic boundary layer turbulence --- wind tunnel test
[AD-A070254] N79-32167
Aerodynamic heating in the fin interaction region of generalized missile shapes at Mach 6 [modular missile test program] --- wind tunnel tests
[AD-A071573] N79-32173
Further results on an array design to measure the wavenumber-frequency spectrum beneath an axisymmetric turbulent boundary layer
[AD-A071048] N79-32505
TURBULENT FLOW
Large eddy simulation of turbulent channel flow: ILLIAC 4 calculation
[NASA-TM-78619] N79-32152
Vorticity-stream function formulation of compressible and incompressible turbulent flows
[AD-A070043] N79-32501
An experimental evaluation of a laser velocimeter by the study of turbulence in a plane free jet at high subsonic velocities
[AD-A070102] N79-32502
European Research Program on Viscous Flows [EUROVISC]
[NLR-MP-78033-U] N79-32519
TWINNING
Deformation twinning and its role in the cavitation erosion response of HCP Co single crystals N79-33078
TWISTING
HiMAT structural development design methodology --- aeroelastic tailoring of the canard and wing box and distributed load tests
[NASA-CR-144886] N79-32197
TWO PHASE FLOW
Stability of density waves in two-phase flow systems N79-32496
Analysis of two-phase flow in nozzles and turbine buckets
[AD-A070754] N79-32506
Description of the 3-dimensional 2-phase simulator SHAFT78 for use in geothermal reservoir studies --- mass and energy balance for two phase flow in porous media
[LBL-8802] N79-32684

U

U.S.S.R.
Geothermal power plants of the Soviet Union. A technical survey of existing and planned installations
[COO-4051-41] N79-32686
Methods for studying and criteria for evaluating the biological effects of electric fields of industrial frequency
[CONF-780541-1] N79-32827
ULTRAHIGH FREQUENCIES
An 800 MHz communications survey of the Los Angeles area
[PB-295043/4] N79-32456
ULTRASONIC RADIATION
Highly efficient transducer arrays useful in nondestructive testing applications
[AD-A070725] N79-32562
Ultrasonic generation in thin films of TbFe2 N79-33073
ULTRASONIC TESTS
Proceedings of the ARPA/AFML Review of Progress in Quantitative Nondestructive Evaluation
[AD-A071047] N79-32563
Eddy current testing and ultrasonic reference standards for depleted uranium barstock
[AD-A070295] N79-32971

ULTRAVIOLET ABSORPTION
Ultraviolet absorption spectrum of methylchloroform in the vapor phase [AERONOMICA-ACTA-A-203-1979] N79-32766
ULTRAVIOLET LASERS
Energy and technology review --- tunable laser system for the ultraviolet, visible, and infrared regions [UCRL-52000-79-3] N79-32727
UNDERGROUND EXPLOSIONS
Measurement system for large motions --- response of geologic media to stress waves from underground nuclear tests [EGG-1183-1634] N79-32777
UNDERGROUND STORAGE
Early screening of nuclear waste retrieval and processing alternatives [LA-UR-78-2412] N79-32998
A survey of packaging for solidified low-level radioactive waste --- studying containers for underground storage [PB-295038/4] N79-33011
UNDERWATER ACOUSTICS
A summary of the results of a study of acoustic interaction with the sea floor [AD-A070954] N79-32973
UNDERWATER ENGINEERING
Development of multifunctional sea-floor instrumental systems [SAND-78-0781C] N79-32820
UNIDENTIFIED FLYING OBJECTS
Correlation techniques for deep space uncorrelated targets [AD-A071014] N79-32425
UNITED STATES OF AMERICA
Wind power climatology of the United States, supplement [SAND-78-1620] N79-32811
UNSTEADY FLOW
A program to compute three-dimensional subsonic unsteady aerodynamic characteristics using the doublet lattic method, L216 [DUBFLX]. Volume 1: Engineering and usage [NASA-CR-2849] N79-32163
The mass and heat transfer in laminar pulsatile flow N79-32492
Unsteady boundary layer separation [AD-A070742] N79-32507
URANIUM
Eddy current testing and ultrasonic reference standards for depleted uranium barstock [AD-A070295] N79-32971
Sputtering of insulators in the electronic stopping region N79-33070
URANIUM FLUORIDES
Sputtering of insulators in the electronic stopping region N79-33070
URANIUM OXIDES
Sputtering of insulators in the electronic stopping region N79-33070
URANUS [PLANET]
The visual and near infrared spectrum of methane and its application to Uranus, Neptune, Triton and Pluto N79-33119
URBAN DEVELOPMENT
Urbanization and its effects on the climate of Phoenix N79-32740
URBAN PLANNING
Transportation systems management element [PB-295349/5] N79-33111
Characteristics of urban transportation demand; appendix [PB-294989/9] N79-33112
URBAN TRANSPORTATION
Paratransit vehicle test and evaluation. Volume 2: Acceleration and interior measurement tests [PB-295476/6] N79-33109
Paratransit vehicle test and evaluation. Volume 5: Noise tests [PB-295479/0] N79-33110
Transportation systems management element [PB-295349/5] N79-33111
Characteristics of urban transportation demand; appendix [PB-294989/9] N79-33112
Proceedings of the 4th US-German Urban Transportation Workshop [PB-294972/5] N79-33113
On-board transit origin-destination survey data: Expanding their use via on-line data access and analysis [PB-294967/5] N79-33114
USER MANUALS [COMPUTER PROGRAMS]
A program to compute three-dimensional subsonic unsteady aerodynamic characteristics using the doublet lattic method, L216 [DUBFLX]. Volume 1: Engineering and usage [NASA-CR-2849] N79-32163
Modal interpolation program, L215 [INTERP]. Volume 1: Engineering and usage [NASA-CR-2847] N79-32164
User's manual for codes CHLG and CHTS: Steady incompressible viscous flow in two-dimensional channels [AD-A069584] N79-32513
METAPHOR [version 1]: Users guide --- performability modeling [NASA-CR-162322] N79-32877
User's guide to program MAD: A computer program for the organization and manipulation of magnetic tape directories [ORNL/TM-6597] N79-33102
USER REQUIREMENTS
Requirements analysis and feasibility study for the Spacelab user program: Supersensitive optical accelerometer [BMFT-FB-W-78-18] N79-32245
A guide and handbook for using the GE Space/RESD libraries [DOC-79SDS030] N79-33101

V

VACUUM APPARATUS
Safety shield for vacuum/pressure chamber viewing port [NASA-CASE-GSC-12513-1] N79-32217
VACUUM MELTING
Observations of the vacuum arc and metal transfer during vacuum consumable arc remelting --- maraging steel alloys [SAND-79-0922C] N79-32342
VACUUM TESTS
X-ray optical characteristics of a Wolter telescope [MPI-PAE/EXTRATERR-146] N79-33123
VALENCE
Experimental studies of valence instabilities [AD-A070352] N79-32306
VALIDITY
Solar radiation model validation [SAND-79-1120C] N79-32712
VALLEYS
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions --- Rio Grande Valley, Texas [E79-10280] N79-32606
VANADIUM OXIDES
An investigation of factors affecting the semiconductor-to-metal transition of V[1-x]W[x]O[2] N79-33076
VAPOR DEPOSITION
Modern technology for semiconductor devices [BMFT-FB-T-78-21] N79-32484
VAPOR PHASES
Ultraviolet absorption spectrum of methylchloroform in the vapor phase [AERONOMICA-ACTA-A-203-1979] N79-32766
VARIANCE [STATISTICS]
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data [E79-10283] N79-32608
VARIATIONAL PRINCIPLES
Theory of connectivity: A unified approach to boundary methods --- integral equations and series expansions [AD-A070198] N79-32909
Variational principles for problems with linear constraints. Prescribed jumps and continuation type restrictions [AD-A070199] N79-32919
Variational description of the positive column with two-stem ionization [NASA-CR-162314] N79-33035
VECTOR SPACES
Robust detectors based on the occupancy vector N79-32905
VEGETATION
The ecological variations in thermal infrared emissivity of vegetation --- in Texas, Arizona, New Mexico, and Mexico [E79-10271] N79-32605
VEGETATION GROWTH
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions --- Rio Grande Valley, Texas [E79-10280] N79-32606
Overview of waste heat utilization techniques --- spray irrigation, soil heating, aquiculture and biomass production [CONF-790443-2] N79-32726
VEHICLES
Paratransit vehicle test and evaluation. Volume 2: Acceleration and interior measurement tests [PB-295476/6] N79-33109
VELOCITY DISTRIBUTION
Velocity field of a round jet in a cross flow for various jet injection angles and velocity ratios --- Langley V/STOL tunnel [NASA-TP-1506] N79-32500
VELOCITY MEASUREMENT
Measurement of the velocity of small projectiles using microwaves [TUM-LRT-RT-TB-77/01] N79-32444

An experimental evaluation of a laser velocimeter by the study of turbulence in a plane free jet at high subsonic velocities [AD-A070102] N79-32502
Improvement of the MVD method [Migration Velocity Determination] [BMFT-FB-T-78-30] N79-32779
VERTICAL AIR CURRENTS
An investigation of low Reynolds number free vertical jet flows N79-32155
VERTICAL LANDING
Qualification tests for helicopters to be used on board ships [NLR-MP-78032-U] N79-32204
VERTICAL TAKEOFF
Qualification tests for helicopters to be used on board ships [NLR-MP-78032-U] N79-32204
VERY LOW FREQUENCIES
A catalog of low-frequency oscillations of the earth's magnetic field as observed as SMS-2 and GOES-2 during December 1977 [PB-294327/2] N79-32793
VIBRATION
Radiation pattern sidelobes and null filling produced by aircraft vibration [AD-A070472] N79-32422
VIBRATION DAMPING
A damped flat-plate coupler for use in calibrating circumaural earphones [NPL-AC-90] N79-32452
VIDICONS
Development of suitable semi-conductor-evaporated coatings for a color-striped vidicon for a single tube color camera [BMFT-FB-T-78-39] N79-33025
VINYL POLYMERS
Binding of anionic dyes to cation-specific poly [crown ethers] N79-32356
Plasma poling of poly [vinylidene fluoride]: Piezoand pyroelectric response [AD-A070750] N79-32361
Ferroelectric polarization in polymers [AD-A070768] N79-32362
Fourier transform infrared analysis of plasma polymerized 2-vinylpyridine thin films [SAND-78-0761C] N79-32366
Piezo and pyroelectric properties of electrets --- made from polymer films [AD-A070808] N79-32475
Fabrication of piezoelectric polymer film [AD-A070822] N79-33090
VIRGINIA
Aviation automated weather observation system [AV-AWOS] [AD-A072119] N79-32805
VISCOELASTICITY
The viscoelastic response of composite materials N79-32268
An application of the theory of materials with variable bonding to solid propellant [AD-A070188] N79-32370
Pneumatic atomization of viscoelastic fluids N79-32493
Static and dynamic finite deformations of viscoelastic solids and structures N79-32567
VISCOSITY
Development of a viscous theory of three-dimensional flow in highly-loaded axial turbomachines [AD-A071049] N79-32554
VISCOUS FLOW
Multi-element airfoil viscous-inviscid interactions [NASA-CR-159125] N79-32157
European Research Program on Viscous Flows [EUROVISC] [NLR-MP-78033-U] N79-32519
Development of a viscous theory of three-dimensional flow in highly-loaded axial turbomachines [AD-A071049] N79-32554
VISUAL OBSERVATION
Observations of the vacuum arc and metal transfer during vacuum consumable arc remelting --- maraging steel alloys [SAND-79-0922C] N79-32342
VISUAL PERCEPTION
A theoretical and experimental analysis of the outside world perception process [NLR-MP-78020-U] N79-32835
VITREOUS MATERIALS
Electroanalytical applications of reticulated vitreous carbon electrodes N79-32296
VOICE COMMUNICATION
A physical method for measuring speech-transmission quality [IZF-1979-1] N79-32451
VOLTAGE AMPLIFIERS
Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules [AD-A070052] N79-32472

VOLTAGE CONVERTERS [DC TO DC]
Square function analysis of the inductor-converter bridge
[ANL/FPP/TM-118] N79-32482
VOLTMETERS
Linear sweep differential pulse voltammetry: Theory and application --- technique and a theoretical equation for combining pulse nature and sweep nature of square waves N79-32525
VORTEX INJECTORS
Aircraft vortex marking program
[NASA-CR-162299] N79-32156
VORTEX RINGS
Frontal dynamics of a Gulf Stream ring --- survey of cyclonic rings N79-32816
VORTICES
A vortex lattice technique for computing ventilated wind tunnel wall interference
[AD-A070445] N79-32220
Longitudinal vortices in a transitioning boundary layer --- wind tunnel investigation
[NASA-TM-80161] N79-32498
Vorticity-stream function formulation of compressible and incompressible turbulent flows
[AD-A070043] N79-32501
VULNERABILITY
Experimental methods for aircraft design qualifications in an exploding warhead environment
[AD-A070381] N79-32203
Military satellite communications, history and status as of 1974
[NRL-TR-74173-U] N79-32254

W

WAFERS
High efficiency cell geometry N79-32653
Electron irradiation of tandem junction solar cells N79-32657
WALL PRESSURE
Estimation of tunnel blockage from wall pressure signatures: A review and data correlation
[NASA-CR-152241] N79-32219
WASHINGTON
Survey of the ground-water geology and hydrology of the Pasco Basin, Washington --- waste disposal potential
[RHO-BWI-C-41] N79-32616
WASTE DISPOSAL
Survey of the ground-water geology and hydrology of the Pasco Basin, Washington --- waste disposal potential
[RHO-BWI-C-41] N79-32616
Report to the Congress on ocean dumping research. Public law 92-532, title 2, section 201
[NOAA-S/T-77-2838] N79-32741
Summary of national and international radioactive waste management programs
[PNL-2941] N79-32995
Nevada nuclear waste storage investigations
[NVO-196-9] N79-32997
Management of radioactive fuel wastes: The Canadian disposal program
[AECL-6314] N79-33000
Risk assessment for radioactive waste disposal
[AECL-6322] N79-33001
A survey of the available methods of solidification for radioactive wastes
[PB-295214/1] N79-33010
A survey of packaging for solidified low-level radioactive waste --- studying containers for underground storage
[PB-295038/4] N79-33011
WASTE ENERGY UTILIZATION
Research and development work for hydrogasification of coal with nuclear processing heat done in the framework of the prototype nuclear processing heater project
[BMFT-FB-T-78-25] N79-32393
Research and development concerning steam gasification of coal: Report on the concept of a prototype plant using nuclear processing heat
[BMFT-FB-T-78-29] N79-32394
Potential use of wood and agriculture wastes as steam generator fuel for thermal enhanced oil recovery
[SAN-1038-PO-1] N79-32717
Overview of waste heat utilization techniques --- spray irrigation, soil heating, aquiculture and biomass production
[CONF-790443-2] N79-32726
The use of the heat pumps to raise temperatures in an economical and ecological way --- domestic heating via industrial waste energy
[BMFT-FB-T-78-35] N79-32732
WASTE WATER
Water related environmental effects in fuel conversion. 1: Summary volume --- water requirements for synthetic fuel technologies
[FE-2445-1-VOL-1] N79-32747
WATER BALANCE
Some evolution and stability trends deduced from energy and water vapor balance models
[AERONOMICA-ACTA-A-201-1979] N79-32795
WATER COLOR
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609
WATER CONSUMPTION
Water related environmental effects in fuel conversion. 1: Summary volume --- water requirements for synthetic fuel technologies
[FE-2445-1-VOL-1] N79-32747
WATER FLOW
Streamflow simulation studies of the Hillsbrough Alafia, and Anclote rivers, west central Florida
[PB-295569/8] N79-32626
WATER INJECTION
Energy extraction operations: Some preliminary results --- thermal energy from granitic rocks by water injection
[LA-UR-79-679] N79-32678
WATER POLLUTION
Satellite monitoring of sea surface pollution --- North Sea
[E79-10287] N79-32611
Report to the Congress on ocean dumping research. Public law 92-532, title 2, section 201
[NOAA-S/T-77-2838] N79-32741
The 16 air and water pollution issues facing the nation: Appendix to report
[CED-78-148C-APP-1] N79-32742
River quality models near outfalls
[OUEL-1270/78] N79-32752
Assessment of surface runoff from iron and steel mills
[PB-294981/6] N79-32756
WATER PRESSURE
Water-cooled turbine blade technology study --- for gas turbines
[PB-295892/4] N79-32215
WATER RESOURCES
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
WATER RUNOFF
River quality models near outfalls
[OUEL-1270/78] N79-32752
Assessment of surface runoff from iron and steel mills
[PB-294981/6] N79-32756
WATER TEMPERATURE
Satellite monitoring of sea surface pollution --- North Sea
[E79-10287] N79-32611
WATER VAPOR
Performance of ceramic materials in high temperature steam and hydrogen
[BNL-25812] N79-32367
WATER WAVES
Steady capillary-gravity waves on deep water N79-32759
Suspended sediment in breaking waves N79-32817
Ocean wave forecasting
[AD-A069469] N79-32819
WATERSHEDS
Selected hydrologic applications of LANDSAT-2 data: An evaluation --- Snowmelt in the American River Basin and soil moisture studies at the Phoenix, Arizona Test Site and at Luverne, Minnesota
[E79-10264] N79-32603
WATERWAVE ENERGY CONVERSION
Renewable ocean energy sources. Part 2: Working papers: ocean winds, currents, waves, tides and salinity gradients
[PB-295876/7] N79-32735
WAVE ATTENUATION
A millimeter wave attenuation and depolarization experiment using the COMSTAR and CTS satellites
[NASA-CR-162315] N79-32442
WAVE PROPAGATION
Guided wave propagation in bounded inhomogeneous media N79-32405
Atmospheric propagation research at 20 and 30 GHz
[ESA-CR[P]-1201] N79-32447
Shear wave propagation in unconsolidated fluid saturated porous media N79-32490
The wave structures of the Eady model of baroclinic instability
[NASA-TP-1548] N79-32796
Development of techniques for the design of athermalized optical systems --- for focusing and boresighting using wave theory
[AD-A070257] N79-33016
Numerical calculations on the propagation of microwaves in highly over-dense magnetized plasma
[IPPJ-404] N79-33028
Cross-field electron heat transport due to high frequency electrostatic waves
[IPPJ-405] N79-33029
WAVEFORMS
Seismological studies using observed and synthetic waveforms --- included are wave amplitudes from earthquakes and nuclear explosions N79-32757
WAVEGUIDES
Guided wave propagation in bounded inhomogeneous media N79-32405
Low cost fiber optic cable assemblies for local distribution systems
[AD-A070723] N79-33022
WAVELENGTHS
Wavelength repeatability of a Cary model 14 R spectrophotometer
[AD-A070704] N79-32528
WEAPON SYSTEMS
Flight test results of a virtual image, pantograph mounted, control and display station
[AD-A070290] N79-32207
WEAR TESTS
Evaluation and auger analysis of a zinc-dialkyldithiophosphate antiwear additive in several diester lubricants
[NASA-TP-1544] N79-32359
WEATHER FORECASTING
Proceedings of the 8th Technical Exchange Conference
[AD-A070009] N79-32806
Statistical adjustment of dynamical tropical cyclone model track predictions
[AD-A070094] N79-32810
WEATHER STATIONS
Summaries of weather observatories at weather stations in Greenland from 1966 to 1970
[ISBN-87-7478-156-1] N79-32813
WEIGHT INDICATORS
Experience with installation and operation of digital electronic balances --- conferences
[LA-UR-79-1029] N79-32530
WEIGHT MEASUREMENT
The ampere, the kilogram, and the fundamental constants. Is there a weighing problem?
[NPL-QU-52] N79-32399
WELDABILITY
Weldability of formable sheet titanium alloy Ti-15V-3Cr-3Al-3Sn
[AD-A070747] N79-32332
On the welding of martensitic hardened steels
[BMVG-FBWT-78-17] N79-32556
WHEAT
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data
[E79-10283] N79-32608
WHEELS
Application of various theories to kinematic shimmy studies
[TUM-MW-14-7701] N79-32550
WHITE NOISE
A study of flicker noise in MOSFETS
[AD-A070313] N79-33080
Investigation of noise in soilds at low temperatures
[AD-A070016] N79-33086
WIDMANSTATTEN STRUCTURE
Fracture toughness of Widmanstatten colonies of an alpha-beta titanium alloy
[AD-A070745] N79-32331
WIND [METEOROLOGY]
Availability of wind power
[SAND-78-0548C] N79-32719
WIND SHEAR
Wind shear during approach: An investigation into the influence of a tower measured wind environment on the symmetric motions of a simulated aircraft during an automatic approach --- DC 9 aircraft
[NLR-TR-77078-U] N79-32192
WIND TUNNEL APPARATUS
Review of design and operational characteristics of the 0.3-meter transonic cryogenic tunnel
[NASA-TM-80123] N79-32159
WIND TUNNEL MODELS
Construction problems for high Reynolds number wind tunnel models
[ONERA-NT-1978-6] N79-32224
WIND TUNNEL TESTS
Pressure gradient effects on supersonic boundary layer turbulence --- wind tunnel test
[AD-A070254] N79-32167
Aerodynamic heating in the fin interaction region of generalized missile shapes at Mach 6 [modular missile test program] --- wind tunnel tests
[AD-A071573] N79-32173
Windtunnel measurements on the interference between a jet and a wing located outside the jet. Part 1: Text, tables, and figures
[NLR-TR-77009-U] N79-32175
Experimental investigation of the aerodynamic characteristics of a wing in a jet flow --- wind tunnel tests
[NLR-TR-77081-U] N79-32177

Wind tunnel tests on cambered wings of mild gothic planform. Part 1: Further low speed tests. Part 2: Transonic tests
[ARC-R/M-3827] N79-32179
The design and aerodynamic characteristics of an 18% thick shock-free airfoil [NLR 7501]
[NLR-MP-78016-U] N79-32180
Measured blockage effects on bluff bodies in closed and open wind tunnels
[RAE-TR-78151] N79-32182
Tunnel 16T performance: Two-and three-stage compressor performance
[AD-A070191] N79-32221
Space shuttle external tank instrumentation evaluation --- wind tunnel tests
[AD-A070443] N79-32257
Longitudinal vortices in a transitioning boundary layer --- wind tunnel investigation
[NASA-TM-80161] N79-32498
Velocity field of a round jet in a cross flow for various jet injection angles and velocity ratios --- Langley V/STOL tunnel
[NASA-TP-1506] N79-32500

WIND TUNNEL WALLS
A vortex lattice technique for computing ventilated wind tunnel wall interference
[AD-A070445] N79-32220

WIND TUNNELS
Estimation of tunnel blockage from wall pressure signatures: A review and data correlation
[NASA-CR-152241] N79-32219
Construction problems for high Reynolds number wind tunnel models
[ONERA-NT-1978-6] N79-32224

WIND VARIATIONS
A bulk model of the atmospheric planetary boundary layer
[DM-28] N79-32790

WIND VELOCITY
Wind power climatology of the United States, supplement
[SAND-78-1620] N79-32811

WIND VELOCITY MEASUREMENT
Development of tunable high pressure CO2 laser for lidar measurements of pollutants and wind velocities, January 1976 to December 1977
[NASA-CR-3175] N79-32540

WINDMILLS [WINDPOWERED MACHINES]
Investigations on the aeroelastic stability of large wind turbines
[NPL-MP-78014-U] N79-32731

WINDOWS [APERTURES]
Development of an industrial process for the production of indium oxide layers for the improvement of the K-values of insulating glass panes
[BMFT-FB-T-78-34] N79-32282
Performance evaluation of solar films and screens
[AD-A070039] N79-32674

WINDPOWER UTILIZATION
Wind turbines
[ANL/CES/TE-78-9] N79-32711
Availability of wind power
[SAND-78-0548C] N79-32719
Wind power climatology of the United States, supplement
[SAND-78-1620] N79-32811

WINDPOWERED GENERATORS
Wind turbines
[ANL/CES/TE-78-9] N79-32711
Availability of wind power
[SAND-78-0548C] N79-32719
Renewable ocean energy sources. Part 2: Working papers: ocean winds, currents, waves, tides and salinity gradients
[PB-295876/7] N79-32735

WING PLANFORMS
Wind tunnel tests on cambered wings of mild gothic planform. Part 1: Further low speed tests. Part 2: Transonic tests
[ARC-R/M-3827] N79-32179

WING PROFILES
Windtunnel measurements on the interference between a jet and a wing located outside the jet. Part 1: Text, tables, and figures
[NLR-TR-77009-U] N79-32175

WINGS
Experimental investigation of the aerodynamic characteristics of a wing in a jet flow --- wind tunnel tests
[NLR-TR-77081-U] N79-32177
HiMAT structural development design methodology --- aeroelastic tailoring of the canard and wing box and distributed load tests
[NASA-CR-144886] N79-32197
Transonic wing redesign using a generalized fictitious gas method
[AD-A070013] N79-32202
Multifrequency eddy current inspection for cracks under fasteners, phase 2
[AD-A071102] N79-32560

WIRE
A study of wire coating extrusion N79-32396

WIRE WINDING
Newly discovered failure mode in high energy density, energy storage capacitors
[LA-7376-MS] N79-32728

WORDS [LANGUAGE]
Block implementation of digital filters N79-32462
An automated thesaurus construction based on a distance measurement between keywords N79-33100

WORK CAPACITY
A statistical methodology for constructing synthetic test workloads N79-32865

WORKLOADS [PSYCHOPHYSIOLOGY]
Performance and workload analysis of inflight helicopter missions
[NLR-MP-77013-U] N79-32834

WYOMING
Geologic application of thermal-inertia mapping from satellite --- Powder River Basin, Arizona and Wyoming
[E79-10282] N79-32607

X

X RAY DIFFRACTION
Fatigue failure prediction by X-ray double crystal diffractometry
[AD-A070296] N79-32327
Experimental evaluation of peak height approximation for X-ray diffracted integrated intensity method
[AD-A070800] N79-32329
X-ray diffraction measurements of crack tip stresses as a crack advances through a single overload affected zone
[AD-A070193] N79-32588

X RAY INSPECTION
Nondestructive measurement of fiber direction and fiber amount in carbon fiber reinforced laminates
[FOA-C-20306-F9] N79-32286

X RAY SOURCES
Satellite observations of rapidly varying cosmic X-ray sources N79-33147

X RAY STRESS MEASUREMENT
Meson factories --- and their applications
[LA-UR-79-1236] N79-32989

X RAY TELESCOPES
X-ray optical characteristics of a Wolter telescope
[MPI-PAE/EXTRATERR-146] N79-33123

XENON
A theoretical and experimental study of the thermal properties of xenon adsorbed on graphite N79-33071

Y

YAW
Design fabrication and installation of a yaw measuring device
[NASA-CR-161300] N79-32526

YIELD
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data
[E79-10283] N79-32608

YIELD POINT
Effect of deep wedge-shaped notches of small flank angle on plastic failure
[OUEL-1282/79] N79-32598

YIELD STRENGTH
Residual strength of [0, + or - 45] sub s and [+ or - 45, 0] sub s carbon/epoxy laminates --- fatigue loading tests
[NLR-TR-77115-U] N79-32287

Z

ZEOLITES
Screening of zeolite catalysts for methanol conversion to light hydrocarbons
[COO-4691-1] N79-32386
Statistical thermodynamics of sorption in molecular sieves N79-33095

ZETA PINCH
Some properties of the reverse-field Z-pinch: An overview
[LA-7798-MS] N79-33050

ZINC SULFIDES
Nucleation and growth of cracks in CVD ZnS under particle impact, part 2
[AD-A069528] N79-32364

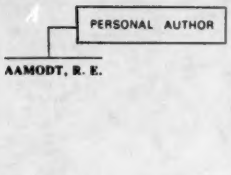
ZIRCONIUM ALLOYS
Long-term storage of irradiated CANDU fuel under water
[AECL-6313] N79-32999

ZODIACAL LIGHT
The zodiacal light experiment E9 on Helios A and B
[BMFT-FB-W-78-28] N79-33132

PERSONAL AUTHOR INDEX

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS VOLUME 17 NUMBER 23

Typical Personal Author Index Listing



Listings in this Index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

ABBINK, F. J. N79-32193
ABBOTT, D. N79-32672
ABBOTT, N. J. N79-32363
ABE, H. N79-33030
ABERCROMBIE, D. N79-32279
ABEYARATNE, R. C. N79-32571
ADAMS, M. N79-32634
ADAMS, T. R. N79-32541
ADCOCK, J. B. N79-32159
AGRAWAL, P. K. N79-32466
AGTERHUIS, E. N79-32450
AICHER, W. N79-32593
AIELLO, G. F. N79-32250
ALAM, K. N79-32949
N79-32956
ALBRIGHT, R. E. N79-32905
ALCAYDE, D. N79-32767
ALDOUS, B. E. N79-32862
ALFVEN, H. N79-32784
N79-33133
N79-33134
ALLARD, P. A. N79-32326
ALLRED, R. E. N79-32710
ALLRED, W. P. N79-33085
ALSPACH, D. L. N79-32953
ALTSEIMER, J. H. N79-32714
AMBROSE, D. N79-32316
ANDERS, J. B. N79-32498
ANDERSON, C. W. N79-32971
ANDERSON, D. I. N79-32402
ANDERSON, H. E. N79-32712
ANDERSON, J. W. N79-32636
ANDERSON, R. C. N79-32753
ANDERSON, R. L. N79-33110
ANDERSSON, J. E. N79-32936
ANDERSSON, K. N79-33106
ANDREE, D. N79-32942
ANDRESEN, R. D. N79-32242
ANDREWS, L. A. N79-32480
ANSPAUGH, B. E. N79-32630
N79-32631
N79-32657
N79-32661
N79-32664
ANTES, H. W. N79-32318
AOKI, H. N79-33027
APLEY, W. J. N79-32692
APPLETON, B. R. N79-33093
APRUZESE, J. P. N79-33045
ARGYRIS, J. H. N79-32593
ARMAND, A. N79-32899
ARNOLD, F. N79-32791
ARNOLD, J. N79-32487
ARNOLD, J. Q. N79-32878
ARNOLD, W. N79-32230
N79-32231
N79-32232
ARONSSON, G. N79-32935
ARP, G. K. N79-32605
ARST, M. C. N79-33017
ATCHISON, J. E. N79-32389
ATZORI, B. N79-32599
AVEZARD, N. N79-32314
AWIN, A. M. N79-32993

B

BAHEI-EL-DIN, Y. A. N79-32269
BALARAM, A. N79-32456
BALCOMB, J. D. N79-32706
BALDWIN, T. E. N79-32699
BALLETT, J. T. N79-32600
BARAONA, C. R. N79-32650
BARFIELD, J. N. N79-32793
BARKHORDAR, P. M. N79-32384
BARLIER, F. N79-32764
BARNES, R. W. N79-32725
BARRETT, R. J. N79-32988
BARRINGER, G. E. N79-32301
BART, W. M. N79-32966
BARTELDS, G. N79-32290
BARTLETT, D. V. N79-33062
BASKHARONE, E. N79-32212
BASSEWITZ, H. V. N79-32244
BASSNER, H. N79-32244
BATEMAN, M. C. N79-32250
BAUER, P. N79-32767
BAXTER, J. D. N79-32857
BAZIN, M. N79-32224
BAZLEY, E. N. N79-32452
BECA, H. N79-32893
BECKERT, D. M. N79-32630
N79-32631
BEECKMAN, R. N79-32521
N79-32601
BEECKMANS, F. N79-32242
BEELER, M. N79-32430
BELL, D. W. N79-32490
BELL, R. N79-32891
BELLIS, F. A. N79-32524
BELYTSCHKO, T. N79-32826
BENDER, D. F. N79-32233
BENEDICT, H. M. N79-32374
BENGURIA, R. D. N79-32981
BENNER, D. C. N79-33119
BENNETT, A. M. N79-32413
BENNETT, J. S. N79-33014
BENT, R. B. N79-32417
BERDAHL, P. N79-32776
BERGER, C. N79-32764
BERNARD, R. N79-32767
BERNDTSSON, B. N79-32930
BERNSTEIN, I. B. N79-32508
BERSHAD, N. J. N79-32470
BERT, C. W. N79-32278
BICKEL, G. W. N79-33023
BICKLER, D. B. N79-32633
BIEG, K. W. N79-32366
BIEGEL, J. N79-32338
BIER, A. N79-32850
BIERBAUM, V. M. N79-32309
BIHLMAYR, H. N79-32730
BILLINGHAM, J. N79-32225
BILSBACK, J. A. N79-33107
BIRD, M. K. N79-32248
BIREY, H. N79-33088
BIRKETT, H. S. N79-32389
BIS, R. F. N79-32676
BISHOP, C. J. N79-32688
BIXBY, H. W. N79-32170
BJARLE, C. N79-33149
BJOERN, L. G. N79-32791
BJORSTAD, P. N79-32882
BLAAUW, G. J. N79-32838
BLACK, J. A. N79-32256
BLACK, S. N79-32213
BLACK, S. A. N79-32334
BLACKWELDER, R. F. N79-32498
BLAKE, G. D. N79-32537
BLAKE, R. L. N79-32698
BLANCO, T. A. N79-32153
BLAUNSTEIN, R. P. N79-32714
BLOOM, F. N79-32432
BOCK, E. N79-32228
BODEAU, D. J. N79-32745
BOES, E. C. N79-32712
BOHNHOFF, K. N79-32244
BOICOURT, G. P. N79-32728
BOISSEAU, J. P. N79-32883
BOLING, N. L. N79-32543
BOLIS, T. S. N79-32559
BOLT, R. A. N79-32853
BOND, D. L. N79-32369
BONNER, J. M. N79-32624
BONNET, D. G. N79-32614
BONNIOT, C. N79-32315
BOOK, D. L. N79-32508
N79-33046
BOREHAM, J. F. N79-32409
BORIS, J. P. N79-32503
BORLAND, R. E. N79-32928
BOSMA, S. J. N79-32729
BOSTIAN, C. W. N79-32442
BOUDREAU, A. H. N79-32165
BOULTON, J. N79-33000
BOUVIER, M. J., JR. N79-32435
BOWEN, S. N79-32230
N79-32231
N79-32232
BOWERS, F. M. N79-32676
BOWMAN, K. J. N79-32186
BOX, G. E. P. N79-32945
BOYLAN, D. E. N79-32169
BRAATZ, P. N79-33083
BRADBURY, J. N. N79-32989
BRAINARD, J. P. N79-32480
BRAINARD, W. A. N79-32359
BRAITINGER, M. N79-32263
BRAMBLE, J. H. N79-32910
BRAMLETTE, T. T. N79-32720
BRANDHORST, H. W., JR. N79-32641
BRASSEUR, G. N79-32763
N79-32765
BRINKMAN, G. A. N79-33007
BRISSEY, G. E. N79-32468
BROADHURST, M. G. N79-32361
N79-32362
N79-32475
N79-33090
BRONFMAN, B. H. N79-32677
BRONISZ, L. N79-32716
BROOKMAN, G. T. N79-32756
BROOKS, L. W. N79-32505
BROWN, O. R. N79-32823
BROWN, R. S. N79-32734
BROWN, V. R. N79-33002
BROWNIE, R. B. N79-32218
BRUCK, M. N79-32733
BRUEVICH, V. V. N79-33124
BRUINSMA, P. J. T. N79-33008
BUCCI, R. J. N79-32323
BUCHROEDER, R. A. N79-33016
BUKAU, F. N79-32732
BUKOWSKI, J. V. N79-32558
BULIK, C. N79-32738
BUNCH, T. E. N79-32241
BUNING, P. G. N79-32510
BUNTSCHUH, C. N79-32469
BURCHFIEL, J. N79-32430
BURES, M. N79-33065
BURMAN, D. Y. N79-32892
BURROWS, K. C. N79-32525
BURTON, R. L. N79-33038
N79-33046
BUTLER, D. N79-32619
BUTLER, R. G. N79-32757
BUTTERWORTH, P. J. N79-32179
BUZBEE, B. N79-32891
BYERS, W. A. N79-32675

C

CAIN, D. L. N79-33140
CAIRD, R. S. N79-33058
CALL, F. W. N79-32963
CALZONETTI, F. J. N79-32724
CAMARDA, C. J. N79-32277
CAMERON, J. N79-33038
CARBAJAL, B. G. N79-32651
CARL, J. N79-32730
CARLEN, C. M. N79-32543
CARNES, S. A. N79-32677

'ARRIGAN, B. N79-32547
'ARROLL, H. B., JR. N79-32621
'ARSTENS, D. H. W. N79-32991
'ARTER, J. N79-33115
'ASE, G. D. N79-32311
'ATON, J. M. N79-33099
'AVAGNARO, D. M. N79-32292
'AVENY, L. H. N79-32262
N79-32325
'AVES, C. M. N79-32761
'ERULLO, N. G. N79-32502
'HAN, K. S. N79-32331
N79-32585
'HANG, K. Y. N79-32317
'HANG, Y. A. N79-32240
'HAPPELL, S. E. N79-32474
'HASEN, L. N79-33101
'HEN, C. T. N79-32536
'HENCHARPENTIER, B. M. N79-32759
'HENG, H. K. N79-32166
'HENG, L. J. N79-32662
'HENG, S. I. N79-32511
'HEO, B. R. S. N79-33043
'HERNOWITZ, G. N79-32153
'HIEN, J. C. N79-32501
'HIH, L. H. N79-32570
'HIM, E. S. N79-32272
'HIN, W. C. N79-32200
'HOI, B. C. N79-32299
'HOUDARY, U. V. N79-32240
'HRISTENSEN, C. R. N79-33014
'HRISTENSEN, R. M. N79-32274
'HUNG, J. N. C. N79-32495
'HUNG, K. L. N79-32932
'ICCOTTI, J. N79-32153
'LAIRMONT, A. R., JR. N79-32371
'LARK, D. N79-32879
'LARK, D. R. N79-32174
'LEMENT, W. F. N79-32198
'LEMENTS, D. W. N79-32478
'LEMMONS, R. E. N79-32161
N79-32162
COBB, J. T., JR. N79-32386
COCHRAN, H. D., JR. N79-32383
COE, P. L., JR. N79-32158
COFFEY, H. E. N79-33146
COFFMAN, J. E. N79-32872
COGHILL, C. C., III N79-32857
COHEN, J. B. N79-32584
COHEN, S. N79-32232
COHN, H. N. N79-33117
COLE, B. L. N79-32186
COLEY, W. R. N79-32762
COLLINS, M. K. N79-32437
COMBS, S. K. N79-32515
COMER, J. R. N79-32847
COMPTON, R. T., JR. N79-32431
CONNERNEY, J. E. P. N79-32758
CONROY, B. L. N79-32409
CONWAY, E. J. N79-32644
N79-32663
COOK, D. R. N79-32748
COON, V. T. N79-32386
COOPER, J. R. A. N79-32884
COOPER, P. A. N79-32277
COOPER, W. N79-32227
CORAOR, R. J. N79-32298
CORBETT, J. W. N79-32662
CORCORAN, M. D. N79-32994
CORMELL, L. N79-32994
CORNELIUS, W. D. N79-32992
CORSARO, R. D. N79-32972
CORTEZ, C. N79-32994
COSTLEY, A. E. N79-33062
COUSTEIX, J. N79-32519
COX, N. D. N79-32998
COY, J. J. N79-32552
CRANDALL, M. G. N79-32918
CRAWFORD, F. W. N79-33035
CRAWFORD, R. W. N79-32310
CRETCHER, C. K. N79-32687
CRISWELL, D. N79-32236
CROMBIE, D. D. N79-32453
CROW, T. N79-32420
CRUZ-URIBE, A. S. N79-32491
CRYER, C. W. N79-32583
CULLEY, C. N79-33109
N79-33110
CURRAN, D. R. N79-32364
CURRAN, E. T. N79-32209

D

DAFLER, J. R. N79-32707
DAHLBERG, E. N79-32449
DAHLQUIST, G. N79-32882
N79-32939
N79-32940
N79-32942
DALLEK, S. N79-32676
DANDL, R. A. N79-33052
DANIELS, D. H. W. N79-32284
N79-32285
DAO, K. C. N79-32364
DASCH, C. J. N79-32987
DAVIDSON, B. C. N79-33039
DAVIES, L. N79-32777
DAVIS, C. N79-32615
DAVIS, G. T. N79-32361
N79-32362
N79-32475
DAVIS, J. N79-33045
DAVIS, J. C. N79-33118
DAVIS, W. C. N79-32538
DAVIS, W. S. N79-33086
DAWSON, J. M. N79-33041
DEAL, P. N79-32227
DEAZLEY, W. N79-32222
DEBOER, E. N79-32176
DEBOOR, C. N79-32913
DECY, V. K. N79-33041
DEEL, O. N79-32201
DEGRAAFF, W. N79-33144
DELAAT, J. C. N79-32467
DELANY, M. E. N79-32452
DELIL, A. A. M. N79-32522
DELOGNE, P. N79-32447
DEMETRI, E. P. N79-32629
DEMETRIADES, S. T. N79-33042
DEOLIVEIRA, M. J. N79-33072
DEROUFFIGNAC, E. P. N79-33071
DESILETS, C. S. N79-32562
DEVRIES, C. N79-33008
DEWITT, D. J. N79-32856
DEYOUNG, R. N79-32539
DICELLO, J. F. N79-32989
DICKENSON, R. L. N79-32385
DIETZ, W. E., JR. N79-32220
DILLION, J. L. N79-32890
DION, B. A. N79-32871
DIPIPPO, R. N79-32686
DIVSALAR, D. N79-32412
DOBECKI, T. L. N79-32775
DOCKTER, L. N79-32375
DODD, B. N79-32598
DODD, J. K. N79-32604
DOELLE, H. N79-32584
DOUGHERTY, N. S., JR. N79-32223
DOUGLAS, E. C. N79-33089
DOWELL, J. T. N79-32985
DOWNING, R. G. N79-32630
N79-32631
DOWSON, M. N79-32446
DOYLE, B. L. N79-33055
DOYLE, M. J. N79-32365
DREVES, D. N79-32821
DRIS, M. A. N79-32994
DRIVAS, P. J. N79-32754
DUBININ, E. M. N79-32781
N79-33143
DUDLEY, V. E. N79-32681
DUMONT, D. N. N79-32849
DUNBAR, R. S. N79-32233
DUNCAN, R. A. N79-32459
DUNSTAN, L. P. N79-32295
DURNEY, A. C. N79-32242
DUSKIN, F. N79-32265
DUYAR, A. N79-32496
DVORAK, F. A. N79-32174
DVORAK, G. J. N79-32269
DVORAK, J. J. N79-33136

E

EARLES, J. A. N79-32833
EASON, H. O. N79-33052
EASTERLING, M. F. N79-32408
EASTMAN, J. A. N79-32748
EDENHOFER, P. N79-32248
EFRON, V. N79-33083
EHLERT, D. N79-32778
EHSANI, M. N79-32482
EIDENSCHINK, R. N79-32535
EISNER, A. N79-32188
EL-HADY, N. M. N79-32494
N79-32499
EL-SAYED, M. A. N79-33084
ELDON, J. A. N79-32259
ELGABALAWI, N. N79-32632
ELKINS, R. E., III N79-33036
ELLISON, G. B. N79-32309
ELMEGREEN, D. A. M. N79-33129
ENGEL, J. H. N79-32229
ERCIL, Y. N79-32668
ERICKSON, D. J. N79-33058
ERICKSON, J. J. N79-32266
ERIKSSON, M. N79-33009
ERSTFELD, T. E. N79-32240
ERTELT, H. J. N79-32593
ERWIN, A. R. N79-32994
ESPARZA, E. D. N79-32203
EVANS, D. L. N79-32691
EWING, E. G. N79-32170
EWING, R. E. N79-32922
EZERSKYI, V. I. N79-33142

F

FABRI, J. N79-32848
FACINELLI, W. A. N79-32691
FAELTHAMUR, C. G. N79-32783
FAIZ, A. R. N79-32155
FALIN, J. L. N79-32764
FALK, R. S. N79-32920
FAN, J. C. C. N79-32666
FANG, R. N79-32204
FANNELOEP, T. K. N79-32519
FANNING, D. N. N79-32555
FANTE, R. L. N79-32422
N79-32434
FARASSAT, F. N79-32210
FARRARO, R. J. N79-33077
FARRIOR, W. L. N79-32311
FAXEN, B. N79-32931
FEARN, R. L. N79-32500
FEDERMAN, S. R. N79-33130
FEINTUCH, P. L. N79-32470
FELDMAN, K. T. N79-32736
FELLER, A. N79-32628
FELLER, J. M. N79-33003
FERGUSON, W. E., JR. N79-32951
FERISS, D. H. N79-32927
FERRANTE, J. N79-32359
FERRIS, B. N79-33111
FERTIG, W. A. N79-32429
FETZER, K. N79-32244
FEUERBACHER, B. N79-32242
FEWELL, L. L. N79-32265
FICHT, W. H. N79-32335
FIELDER, G. N79-32611
FILLO, J. A. N79-32367
N79-32388
FINE, K. N79-32230
N79-32231
N79-32232
FIORENTINO, A. J. N79-32211
FISHER, B. N79-32470
FISHER, G. B. N79-32307
FLANDERS, D. C. N79-33091
FLEMING, E. S. N79-32380
FLEMING, W. H. N79-32898
FLOOD, W. A. N79-32771
FLOYD, R. P. N79-32792
FOLTZER, L. E. N79-33023
FONTANARI, G. N79-32767
FORD, F. P. N79-32878
FORGY, C. L. N79-32873
FOSS, A. C. N79-32468
FOUDIN, L. N79-32823
FOWLER, C. M. N79-33058
FOWLIS, W. W. N79-32796
FRAME, J. S. N79-32915
FRANCHI, P. R. N79-32424
FRANKE, R. N79-32914
FRANZ, O. G. N79-33122
FRASER, K. F. N79-32527
FREDERICK, R. H. N79-32815
FREDERIKSEN, M. J. N79-32372
FREED, A. N79-32425
FREEDMAN, R. S. N79-32901
FREEMAN, B. L. N79-33058
FRESA, F. N79-32599
FRESCH, D. C. N79-32564
FRIBERG, J. N79-32933
FRIIS-CHRISTENSEN, E. N79-32785
FRILL, D. R. N79-32810
FROMM, A. N79-32428
FROWEIN, H. W. N79-32839
FRY, J. N. N79-33127
FUKUMASA, O. N79-33030
FULKER, J. L. N79-33178
FURCHTGOTT, D. G. N79-32877

G

GAFFEY, M. J. N79-32234
N79-32235
GAGGIOLI, R. N79-32379
GAMBHIR, S. K. N79-32406
GAMPE, F. N79-32247
GANY, A. N79-32262
GARDNER, S. D. N79-32996
GARN, W. B. N79-33058
GATTI, A. N79-33019
GAUSMAN, H. W. N79-32606
GAVIN, L. W. N79-32391
GAZZARA, C. P. N79-32329
GEBHARDT, J. J. N79-33019
GEBHART, F. L. N79-32266
GEHNER, C. D. N79-33114
GENNARO, A. N79-33021
GENTRY, M. L., JR. N79-32970
GEORGE, N. N79-33014
GEPHART, L. S. N79-32880
GERLACH, T. M. N79-32373
GERWIN, R. N79-33050
GIBSON, P. L. N79-32194

GIESKE, J. H. N79-32340
GIFFARD, R. P. N79-32429
GILBREATH, W. N79-32225
GILES, D. N79-32241
GILLILAND, P. N79-32823
GINS, J. D. N79-32259
GIOVAN, M. N79-32634
GLAESER, H. J. N79-32282
GLAZ, H. M. N79-32439
GLOCKMANN, H. P. N79-32529
GODLEWSKI, M. P. N79-32649
GOERGEMANNS, H. N79-33006
GOFF, J. R. N79-32297
GOKCEN, N. A. N79-32671
GOLD, H. N79-32747
GOLD, T. N79-33141
GOLDSMITH, J. V. N79-32633
GOLDSTEIN, D. J. N79-32747
GOLLON, P. J. N79-32994
GONSALVES, J. B. N79-33094
GOODMAN, A. S. N79-32734
GOODWIN, S. L. N79-32363
GORDON, B. G. N79-32472
GORDON, R. J. N79-32754
GORLA, R. S. R. N79-32552
GOSSET, B. N79-32225
GRACE, W. N79-32553
GRAHAM, M. L. N79-32162
GRAHAM, R. E. N79-32256
GRANDAL, B. N79-32791
GRAY, W. H. N79-33102
GRAYBEAL, W. T. N79-32865
GREEN, D. A. N79-32311
GREENE, W. N79-32211
GREENWALD, C. M. N79-32880
GRESHO, P. M. N79-32517
GRIFFITH, J. E. N79-33070
GRIMMER, D. P. N79-32716
GRINBERG, J. N79-33083
GROSS, L. W. N79-32157
GROSSE, E. N79-32882
GROSSMANN, K. U. N79-32532
GROTE, H. H. N79-32208
GRUENDLING, G. K. N79-32625
GRUNBERGER, P. J. N79-32852
GUENTHER, B. D. N79-33014
GUENTHER, M. E. N79-32369
GUILLORY, J. N79-33040
GULL, C. D. N79-33105
GULLICKSON, R. L. N79-33053
GUMASTE, U. V. N79-32476
GUNN, N. J. F. N79-32600
GUPTA, S. K. N79-32492
GUSTAFSON, S. A. N79-32887
GUSTAVSON, F. G. N79-32844

H

HACK, H. P. N79-32333
HACKETT, J. E. N79-32219
HACKING, K. N79-32523
HAERKKI, J. N79-32343
HAGEN, O. N79-32791
HAJOUSKY, R. N79-32456
HALL, I. J. N79-32712
HALL, R. M. N79-32159
HALL, R. N. N79-32653
HALL, T. C. N79-32266
HALVERSON, D. R. N79-32433
HAMED, A. N79-32212
HAMPTON, H. L. N79-32709
HANKE, I. N79-32488
HANKEY, W. L. N79-32510
HANSEL, A. N79-32789
HARDY, R. W. N79-32651
HARLAN, A. N79-32227
HARMON, K. M. N79-32995
HARRIS, C. J. N79-32752
HARRIS, H. G. N79-32375
HARRIS, J. S., JR. N79-32673
HARRIS, M. J. N79-32680
HARRIS, P. N79-33079
HARRIS, S. D. N79-32831
HARRISON, B. A. N79-32163
HARRISON, E. A. N79-32830
HART, R. E., JR. N79-32665
HART, S. G. N79-32185
HART, W. G. J. N79-32280
N79-32281
N79-32287
N79-32289
N79-32291
HARTMAN, S. R. N79-33137
HARVEY, E. H. N79-32994
HASHEMI, J. S. N79-32569
HASKELL, K. H. N79-32924
HASSAB, M. A. H. M. N79-32497
HASSELMANN, K. N79-32819
HAUSE, L. G. N79-32457
HAWKE, R. S. N79-33097
HAWKER, K. E. N79-32973
HAYES, C. L. N79-32538
HAYES, J. R. N79-32173
HAYFORD, D. T. N79-32560
HEATH, G. E. N79-32426
HEATHCOCK, W. N79-32456
HEEMSKERK, J. F. N79-32522
HEIDERSBACH, R. H., JR. N79-32328
HEILIG, P. T. N79-32251
HEIMANN, B. N79-33025
HEIMILLER, R. C. N79-32428
HELIN, E. F. N79-32235
HELTSLEY, F. L. N79-32220
HEMING, F. S. N79-32586
HENDRON, R. H. N79-32678
HENNING, W. N79-32484
HENRY, H. G. N79-33076
HERRERA, I. N79-32909
N79-32919
N79-33149
N79-32627
N79-32748
N79-32750
N79-32925
N79-32622
N79-32613
N79-32699
HERRSTROEM, N. Y. N79-32528
HETYEI, S. A. N79-32164
HICKS, B. B. N79-32218
N79-32541
N79-32519
N79-32966
N79-32532
N79-32308
N79-32237
N79-32654
N79-32564
N79-32245
N79-32636
N79-32204
N79-32812
N79-32880
N79-32751
N79-33012
N79-33010
N79-32954
N79-32588
N79-32957
N79-32915
N79-32367
N79-32376
N79-32896
N79-32190
N79-32693
N79-32451
N79-32975
N79-32976
N79-33049
N79-33139
N79-32740
N79-32732
N79-32745
N79-32859
N79-32474
N79-33056
N79-32293
N79-32738
N79-33128
N79-32587
N79-32796

HIEBERT, K. L.
HIELKEMA, J. U.
HIGGINS, M. W.
HILL, L. G.
HILLS, M. E.
HIRAYAMA, M. Y.
HIRONAKA, M. C.
HIRSCH, E. H.
HIRSCHEL, E. H.
HIRSHFELD, S.
HIRT, U.
HIRTH, J. P.
HO, D.
HO, F. F.
HOCHREIN, A. A., JR.
HOCK, F.
HOEHN, F. W.
HOEKSTRA, T.
HOFFMAN, H. W.
HOFFMAN, M. M.
HOFMANN, F.
HOJAJI, H.
HOLCOMB, W. F.
HOLLANDER, M.
HOLLOWAY, D. R.
HOLM, S.
HOOVER, W. E.
HORN, F. L.
HORNIG, H. C.
HOROWITZ, I.
HOSTETLER, L. D.
HOUSE, P. A.
HOUTGAST, T.

HOVINGH, J.
HOWARD, H. T.
HSU, S. I.
HUBER, M.
HUEBNER, R. H.
HUFF, S. L.
HUMPHREYS, J. C.
HUMPHRIES, S., JR.
HUNTER, R. L.
HURLEY, C. W.
HURWITZ, H. A.
HUSSIAN, M. A.
HYUN, J. M.

I

IBOK, E. U. N79-32461
IGELBUESCHER, H. N79-32751
IKEGAMI, H. N79-33052
IKOKU, C. U. N79-32516
IKUTA, K. N79-33032
ILENBURG, W. R. N79-32245
ILES, P. A. N79-32654
IMBIEL, H. N79-32244
INMAN, B. N79-32374
INNERS, R. R. N79-32979
IRISH, P. A., III N79-32832
ISHIMARU, A. N79-32419
ISOM, M. P. N79-32974
ITATANI, R. N79-33030
IWAI, T. N79-33034

J

JAASMA, D. R. N79-32302
JACKSON, C. W. N79-32534
JACOBS, F. A. N79-32350
JACOBS, P. A. N79-32895
JAECKEL, G. N79-33151
JAVAN, A. N79-32540
JAWOROWSKI, A. N79-32662
JAYROE, R. R., JR. N79-32612
JEFFREYS, R. T. N79-32832
JELTSCH, R. N79-32940
JENKINS, D. J. N79-33038
JENKINS, J. M. N79-32151
JENNINGS, J. B. N79-32621
JEWELL, W. F. N79-32198
JIRU, P. N79-32488
JOENSSON, G. N79-33149
JOHNSON, B. V. N79-32215
JOHNSON, C. N79-32929
JOHNSON, J. L. N79-32391
JOHNSON, L. P. N79-32760
JOHNSON, V. S. N79-32158
JOLLY, S. T. N79-33089
JONES, G. F. N79-32708
JONES, G. W. N79-33116
JONES, J. L. N79-32385
JONES, R. E. N79-32924
JONES, S. T. N79-32903
JONES, T. B. N79-32479
JONES, T. J. N79-32841
JONES, W. B. N79-32340
JOOSEN, C. J. J. N79-32177
JORDAN, E. H. N79-32589
JULIANO, T. M. N79-32573

K

KAHNG, C. H. N79-32336
KALINOWSKI, J. N79-32777
KALLIO, G. A. N79-32479
KAMATH, G. S. N79-32669
KAMATH, S. N79-32664
KAMIMURA, T. N79-33033
KANA, T. W. N79-32817
KANEKO, Y. N79-33034
KANOFSKY, A. N79-32994
KANT, T. N79-32576
KANURY, A. M. N79-32303
KAPLAN, D. N79-32230
N79-32231
N79-32232
KAPLAN, S. J. N79-32867
KAPUSTA, S. D. N79-32294
KAREL, M. N79-32227
KARINS, J. P. N79-32662
KARL, F. N79-32593
KAUFMAN, W. E. N79-32964
KAUFMANN, K. N79-32444
KEDDY, E. S. N79-32518
KEE, R. J. N79-32313
KEELER, R. J. N79-32489
KELLER, R. N79-32697
KELLERMEIER, H. N79-32244
KELTON, P. W. N79-33120
KEMP, E. L. N79-32728
KENNEDY, B. W. N79-32808
KENNEDY, J. K. N79-33085
KENNEY, J. M. N79-33090
KESTIN, J. N79-32685
N79-33096
KHALIFA, H. E. N79-33096
KHEMTHONG, S. N79-32654
KHO, Y. G. N79-32175
KIEFER, B. V. N79-32568
KIERNER, G. N79-32593
KILYACHKOV, N. N. N79-33124
KIM, J. N79-32152
N79-32211
KIMURA, H. N79-33018
KING, D. W. N79-33108
KINO, G. S. N79-32562
KIRKPATRICK, A. R. N79-32648
KIRSHTEN, P. M. N79-32213
KLECKER, B. N79-33148
KLEE, V. N79-32912
N79-32916
N79-32917
KLEEKAMP, C. W. N79-33015
KLEINAU, W. N79-32244
KLEINE, H. N79-32875
KLEINLEIN, G. N79-32244
KLIMCAK, C. M. N79-33066
KLIMES, I. N79-32304
N79-32305
KLINGAUF, S. N79-32556
KLOTZ, H. N79-32245
KLUCHER, T. M. N79-32649
KLUG, A. N79-32854
KLUNDER, J. D. N79-32972
KNABE, W. N79-32245
KNACKE, T. W. N79-32170
KNECHTLI, R. C. N79-32664
KNIGHT, R. B. D. N79-32860
KNOTT, K. N79-32242
KOCKARTS, G. N79-32764
N79-32767
KOHAN, S. M. N79-32384
N79-32385
KOLM, H. N79-32230
N79-32231
N79-32232
KOLM, M. N79-32230
N79-32231
N79-32232
KONDO, N. N79-32977
KONLE, W. N79-33024
KONONENKO, W. N79-32994
KORB, J. T. N79-32866
KOSMAHL, H. G. N79-32463
KOSS, D. A. N79-32331

KOSSTRIN, H. M. N79-32585
KOWALSKI, S. H. N79-32717
KRACK, K. N79-32206
KRAMER, L. R. N79-33086
KRANKOWSKY, D. N79-32327
KRAUSE, J. N79-32791
KREMESEC, V. J. N79-32535
KRESOVICH, S. N79-32620
KRIEGL, W. N79-32389
KRIJN, R. N79-32445
KRISTIANSSON, K. N79-32193
KROLL, R. I. N79-33149
N79-32161
N79-32164
KROUPENIO, N. N. N79-33142
KRUGER, R. P. N79-32565
KRUISBRINK, J. N79-32861
KUMAR, B. N79-33096
KUNHARDT, E. E. N79-33043
KUNIBE, T. N79-33027
KUNZE, C. N79-33025
KUO, A. L. N79-32978
KUO, S. P. N79-33043
KURODA, T. N79-33027
KURTH, R. B. N79-32423
KURY, J. W. N79-32376
KUSH, E. A. N79-32704
KUSHNER, H. J. N79-32898
KUSTOM, R. L. N79-32482

L

LABRUJERE, T. E. N79-32181
LACOSS, R. T. N79-32438
LADERMAN, A. J. N79-32167
LADSON, C. L. N79-32159
LAFUZE, D. L. N79-32468
LAMBROU, F., JR. N79-32228
LAMORTE, M. F. N79-32672
LAMPARSKY, D. N79-32304
N79-32305
LANDY, R. J. N79-32339
LANG, J. N79-32247
LANGBEIN, D. N79-32245
LANHAM, R. E. N79-33038
LARMAN, D. N79-32917
LARSON, B. C. N79-33093
LARSON, R. W. N79-32428
LARSSON, N. N79-32348
LASHMORE-DAVIES, C. N79-33048
LAURITZEN, T. N79-32545
LAWHON, W. T. N79-32389
LAWING, P. L. N79-32159
LAWLER, G. F. N79-32962
LAWRENCE, W. T. N79-32629
LAWS, N. N79-32268
LAZENGER, B. N79-33100
LEACH, A. E. N79-32332
LEAHY, J. N79-32417
LEAMER, R. W. N79-32606
LEE, A. N79-32153
LEE, D. W. N79-32629
LEE, F. J. S. N79-32864
LEE, P. N79-32179
LEE, R. L. N79-32517
LEE, R. W. N79-32493
LEE, S. N79-32602
LEE, S. M. N79-32238
LEE, Y. H. N79-32662
LEFFEL, C. S., JR. N79-32739
LEFFERTS, R. E. N79-32414
LEFTWICH, P. W. N79-32814
LEHNERT, B. N79-33064
LEIBE, H. J. N79-32453
LEIJNSE, C. N79-32204
LEINERT, C. N79-33132
LEONE, S. R. N79-32309
LEURGANS, S. N79-32921
LEVEQUE, R. N79-32942
LEVI, M. N79-32965
LEVINSON, H. S. N79-33112
LICCIARDELLO, D. C. N79-32360
LILLEY, D. E. N79-32219
LIM, J. S. N79-33013
LIND, M. A. N79-32709
LINDGREN, E. R. N79-33036
LINDHOLM, F. A. N79-32647
LINDQUIST, A. N79-32911
N79-32946
LINDSTROEM, L. N79-32662
LINDVALL, T. N79-32932
N79-32937
LING, R. F. N79-32955
LINK, H. N79-33132
LIOR, N. N79-32708
LIPINSKY, E. S. N79-32389
LIPOFSKY, B. J. N79-32417
LISKOV, B. N79-32879
LITTLE, M. N79-33083
LIU, A. S. N79-33140
LIU, L. M. S. N79-32944
LIU, S. G. N79-33089
LIU, Y. C. N79-32368
LLEWELLYN, S. K. N79-32417
LOCKMAN, F. J. N79-33131
LOEHLE, H. N79-32445
LOFERSKI, J. J. N79-32668
N79-32671
LOHRKE, R. I. N79-32682
LONDON, P. E. N79-32889
LONG, W. H., JR. N79-33044
LONGRIDGE, T. M., JR. N79-32832
LOO, R. N79-32664
LORELL, K. R. N79-33121
LORIMER, D. H. N79-32312
LUHMANN, N. C., JR. N79-33051
LUNDIN, M. N79-32934
LUTZ, D. C. N79-32857
LYON, R. B. N79-33001
LYTTLETON, R. A. N79-33140
LYZENGA, D. N79-32615

M

MA, C. Q. N79-33069
MAARSINGH, R. A. N79-32177
MABRY, J. E. N79-32969
MACCHETTO, F. N79-32242
MACFARLANE, R. E. N79-32988
MACNEAL, B. E. N79-33068
MADSEN, V. A. N79-33002
MAFFETT, A. N79-32428
MAHNKEN, G. N79-32418
MAILEN, G. S. N79-32515
MAILLOUX, R. J. N79-32424
MAMNISCHKY, V. I. N79-33142
MANHEIMER, W. N79-33048
MANZIONE, L. T. N79-32357
MARKHAM, D. M. N79-33042
MARSH, J. E. N79-32171
MARTIN, M. N79-32776
MASKELL, R. E. N79-32436
MASKEW, B. N79-32174
MASRY, E. N79-32952
MATLIN, R. W. N79-32700
MATSON, M. N79-32603
MATSUMOTO, A. N79-33034
MATTHEI, K. W. N79-32648
MATTHEYSES, R. M. N79-32476
MATZEN, W. T. N79-32651
MAURER, G. S. N79-33147
MAXWELL, C. D. N79-33042
MAZARIS, G. A. N79-32649
MCCLISH, D. K. N79-32900
MCCLURE, T. A. N79-32389
MCDONALD, D. N79-33108
MCDONALD, R. K. N79-32717
MCDONOUGH, J. D. N79-32332
MCGINNIS, D. F., JR. N79-32603
MCKAY, D. S. N79-32239
N79-32241
MCKINNEY, J. E. N79-32361
MCLEAN, E. A. N79-33037
N79-33047
MCNEESE, L. E. N79-32383
MEADE, N. F. N79-32753
MEHRABADI, M. M. N79-33075
MEHTA, S. M. N79-32264
MEIER, P. F. N79-32982
MEISTER, R. P. N79-32560
MELINDER, I. N79-32938
MELLANDER, I. N79-32935
MELTON, W. C. N79-32687
MENDOZA, E. N79-32319
MENG, S. Y. N79-32166
MERGES, V. N79-32730
MERHAV, S. N79-32205
MEULENBERG, A. N79-32646
MEYER, F. W. N79-32245
MEYER, J. F. N79-32876
N79-32906
MICCI, M. M. N79-32262
MICHAEL, G. A. N79-33103
MIDDLESWORTH, B. C. N79-32756
MILENKOVIC, M. N79-32845
MILLARD, G. H. N79-32403
MILLER, D. L. N79-32673
MILLER, N. E. N79-33011
MILLER, R. A. N79-32897
MILLER, R. D. N79-32162
MILLER, S. H. N79-32607
MILLS, G. L. N79-32705
MINAMI, K. N79-33028
MINNUCCI, J. A. N79-32648
MINSTER, J. E. N79-32358
MIRZA, J. H. N79-32846
MISKI, T. N79-32245
MITRA, A. N79-32955
MITTRA, R. N79-32440
MIYAHIRA, T. F. N79-32630
N79-32631
MJKHERJEE, A. K. N79-32657
MODELL, M. N79-32279
N79-32226
N79-32227
MOE, P. N79-32227
MOIN, P. N79-32152
MOONEY, P. M. N79-32662
MORALES, G. M. N79-33041
MOREAU, J. P. N79-32968
MORELLI, F. N79-32822
MORGAN, J. A. N79-33126
MOROZOV, Y. A. N79-32827
MORRIS, R. A. N79-32565
MORRIS, S. O. N79-32325
MORRISON, J. D. N79-32358
MOULDEN, T. H. N79-32168
MRVA, M. N79-32448
MUCH, C. H. N79-32702
MUELLER, R. N79-32485
MUENCH, R. D. N79-32821
MULHOLLAND, R. G. N79-32415
N79-32416
MULLALY, J. R. N79-32326
MULLER, G. E. N79-32183
MURARKA, I. P. N79-32745
MURPHY, R. W. N79-32515
MUSIKANT, S. N79-33019
MUSTAIN, J. A. N79-32410
MYER, G. E. N79-32625

N

NAEVERT, U. N79-32929
NAGEL, J. N79-32473
NAGY, D. J. N79-32352
NAIK, V. N79-32420
NAITOU, H. N79-33029
NAMKEN, L. N. N79-32606
NANDAKUMAR, K. N79-32958
NANDI, S. P. N79-32391
NARAYAN, J. N79-32655
N79-33093
NASH, P. J. N79-32557
NAUS, D. J. N79-32592
NAVON, E. N79-32405
NAYFEH, A. H. N79-32499
NEIDERHEISER, W. N79-32822
NEIDIG, A. N79-32486
NELSON, D. B. N79-33054
NEUGROSCHEL, A. N79-32647
NEUMANN, R. D. N79-32173
NEWBURN, R. L., JR. N79-33138
NEWELL, R. E. N79-32793
NEWMAN, J. N79-32230
N79-32231
N79-32232
NEYMAN, J. N79-32947
NG, R. N79-32392
NICOLIS, C. N79-32794
N79-32795
NIEMANN, J. R. N79-32199
NIKONOVA, K. V. N79-32827
NIXON, P. R. N79-32606
NOBACK, R. N79-32216
NOBLE, B. N79-32587
NOBLE, J. A. N79-32169
NOCKER, R. N79-32448
NORDBY, H. J. N79-32566
NORDMAN, D. N79-32689
NORTH, R. A. N79-32831
NOVIL, M. N79-32707
NOYES, R. N79-32777
NUISMER, R. J. N79-32270
NUNZ, G. J. N79-32690

O

OAKES, J. G. N79-33082
OBENSCHAIN, S. P. N79-33047
OBRIEN, M. N79-32551
OEHRLEN, G. N79-32662
OESTBERG, K. N79-33026
OFFERMANN, D. N79-32532
OFFIELD, T. W. N79-32607
OGG, J. C. N79-32509
OHSAWA, Y. N79-33033
OHTANI, S. N79-33034
OKA, Y. N79-33027
OKAMURA, H. N79-33027
OKUNO, K. N79-33034
OLEARY, B. N79-32225
N79-32234
N79-32235
OLIVER, D. A. N79-33042
OLSEN, L. C. N79-32737
OLSON, D. B. N79-32816
OLSZEWSKI, M. N79-32726
OMEARA, D. J., JR. N79-32300
ONDRUSCH, A. N79-33123
ONEILL, G. N79-32349
ONEILL, G. K. N79-32230
N79-32231
N79-32232
OSBORN, J. E. N79-32920
OSTER, C. A. N79-32828
OSTERFELD, D. H. N79-32880
OSTROFSKY, B. N79-32840
OTTENS, H. H. N79-32255
N79-32731
OTTERBEIN, R. T. N79-32691

OTTESEN, D. K. N79-32366
OWEN, T. B. N79-32182
OWENS, J. M. N79-32831

P

PADDISON, F. C. N79-32739
PAIK, H. J. N79-33086
PALMEDO, P. F. N79-32722
PAMMER, E. N79-32484
PANAYOTOU, N. F. N79-33057
PANGBORN, R. N. N79-32327
PARKER, J. A. N79-32265
PARKS, R. D. N79-32306
PARPART, M. K. N79-32353
PARSONS, E. K. N79-33121
PATIL, S. N79-32576
PATRINOS, A. A. N79-32812
PEACOCK, A. N79-32242
PEARSON, J. W. N79-32398
PEARSON, R. N79-32213
PECHSTEIN, H. H. N79-32247
PEELLE, E. N79-32677
PEGGS, G. N. N79-32533
PENSTON, M. N79-32242
PERLMAN, R. N79-32430
PERONE, S. P. N79-32675
PERRY, C. R. N79-32608
PERSSON, M. N79-32986
PETERS, J. W. N79-32266
PETERS, N. N79-32483
PETERSON, D. E. N79-32402
PETERSON, P. R. N79-32755
PETLEY, B. W. N79-32399
PHILLIPS, J. N79-32227
PHINNEY, D. E. N79-32605
PHIPPS, G. S. N79-32703
PICKERING, S. M., JR. N79-32613
PICRAUX, S. T. N79-32990
PIERS, W. J. N79-32176
PIPES, R. B. N79-32271
N79-32574
PISZKER, L. D. N79-32441
PITRUZZELLO, M. C. N79-32207
PITTS, W. M. N79-33084
PITZ, E. N79-33132
PLUMMER, W. W. N79-32430
PODGORNY, I. M. N79-32781
N79-33143
POHL, L. N79-32535
POLACK, J. A. N79-32389
POMPA, M. F. N79-32156
POPE, M. D. N79-32700
POROPAT, G. V. N79-32858
PORSCHE, H. N79-32248
PORTIG, W. H. N79-32561
POSTAL, R. B. N79-32409
POTANIN, Y. N. N79-32781
N79-33143
POTEMRA, T. A. N79-32785
POUKEY, J. W. N79-33056
POWELL, C. A. N79-32743
N79-32744
POWELL, J. D. N79-33121
POWELL, J. R. N79-32367
N79-32388
PRABHAKARAN, R. N79-32575
PRAGER, J. M. N79-32870
PRAIRIE, R. R. N79-32712
PRASAD, S. N79-33078
PRICE, C. C. N79-32869
PRICE, D. N79-32371
PRICE, L. C. N79-32904
PRICE, M. A. N79-32197
PRICE, M. J. N79-33122
PRIKRYL, P. N79-32730
PRIVITZER, E. N79-32826
PRONKO, P. P. N79-33093
PROPHET, D. M. N79-32455
PRUESS, K. N79-32684
PU, S. L. N79-32587
PUNWANI, D. V. N79-32391
PUTNAM, D. N79-32227

Q

QUATTRONE, P. N79-32227
QUERE, C. N79-32520
QUINLAN, M. H. N79-32370
QUINN, R. K. N79-32378
QUY, R. B. N79-32980

R

RACKOFF, M. G. N79-32707
RADOSEVICH, L. G. N79-32694
RAE, W. J. N79-32172
RAHILLY, W. P. N79-32670
RAJU, B. B. N79-32277
RALL, L. B. N79-32908
RAMEY, H. J., JR. N79-32516
RAMONDETTA, P. N79-32464
RANKEN, W. A. N79-32465
RANSONE, P. O. N79-32628
RAO, D. A. N79-32518
RAO, D. B. N79-32358
RAPP, C. F. N79-32396
RAPP, R. A. N79-32240
RAPP, T. H. N79-32543
RATLIFF, F. R. N79-32308
RATLIFF, J. D. N79-32769
RAU, B. R. N79-32833
RAUCH, H. W., SR. N79-32855
RAY, E. J. N79-33019
READY, J. F. N79-32159
REECE, E. W. N79-32546
REED, F. A. N79-32820
REED, J. A. N79-32470
REED, J. W. N79-32221
N79-32719
REED, W. E. N79-32811
REICH, G. N79-32454
REIFSNIDER, K. L. N79-32531
REILLY, J. J. N79-32273
REILLY, N. B. N79-32387
N79-32410
REINHARD, R. N79-32411
REISTAD, D. N79-32242
REMMERS, H. E. N79-33009
RENES, J. J. N79-32705
RENIRIE, L. T. N79-32926
REUTER, R. C., JR. N79-32204
RICE, D. P. N79-32710
RICE, S. A. N79-32780
RICHARD, J. P. N79-32984
RICHARD, M. N79-33086
RICHARDSON, A. J. N79-32163
RILEY, J. L. N79-32606
RIPIN, B. H. N79-32523
N79-33037
RIPP, J. A. N79-33047
RIPPEY, W. G. N79-32756
RITTER, K. N79-32738
N79-32959
RITTNER, E. N79-32960
RITZI, E. N79-32961
ROACHE, P. J. N79-32646
N79-32506
N79-32512
N79-32513
N79-32514
RODERER, N. N79-33108
RODRIGUE, G. N79-32891
RODRIGUEZ, L. N79-32379
RODRIGUEZ, L. F. N79-33125
ROGOVIN, D. N79-32473
ROHDE, M. N79-33145
ROMBERG, K. M. N79-32434
RORRER, D. E. N79-32738
ROSANDER, S. N79-33009
ROSCHKE, E. J. N79-32632
ROSENKILDE, C. E. N79-32774
ROSS, D. J. N79-32233
N79-32234
ROSSINI, P. L. N79-32702
ROTH, S. C. N79-33090
ROUFOSSE, M. C. N79-32818
ROUSSEAU, W. F. N79-32695
ROZENDAL, D. N79-32180
RUBBERT, P. E. N79-32202
RUPPE, H. O. N79-32263
RUSTAGI, J. S. N79-32824
RUTHERFORD, S. R. N79-32973
RYAN, R. F. N79-32983

S

SAFAI, S. N79-32320
SAFAVI-NAINI, S. N79-32440
SAH, R. C. N79-32545
SAKAIDA, R. R. N79-32755
SALEH, Y. N79-32321
SALINAS, D. N79-32914
SALKELD, R. N79-32234
SALM, N. N79-33132
SALMON, L. E. N79-32383
SAMEJIMA, F. N79-32950
SAMMON, P. H. N79-32910
SAMUELS, G., JR. N79-32677
SANDERS, A. F. N79-32837
SANDOR, B. I. N79-32589
SANI, R. L. N79-32517
SANTINI, D. J. N79-32699
SATTLEGGER, J. N79-32779
SAVIN, B. M. N79-32827
SCHEELINE, A. N79-32460
SCHETZ, J. A. N79-32509
SCHIJVE, J. N79-32350
SCHILL, I. N79-32286
SCHLESSINGER, L. N79-32544
SCHMID, C. J. N79-32183
SCHMIDT, S. C. N79-32377
SCHMUCKER, R. H. N79-32263
SCHNATTINGER, W. N79-32247
SCHOLD, S. N79-33111
SCHOLL, G. N79-32751
SCHOOLEY, F. A. N79-32385
SCHRA, L. N79-32351
SCHRADER, L. N79-32393
SCHRIEDER, W. N79-32247
SCHROEDER, R. C. N79-32684
SCHUMACHER, J. D. N79-32821
SCHURRING, J. N79-32192
SCHWEITZER, M. N79-32677
SCOTT-MONCK, J. A. N79-32643
N79-32657
N79-32661
SCOTT, J. M. N79-32745
SCOTT, J. P. N79-32943
SEAMAN, C. H. N79-32635
SEIFERT, D. J. N79-32842
SEIFERT, K. N79-32556
SEITHER, R. N79-32823
SEITZ, W. L. N79-32377
SELFRIDGE, A. R. N79-32562
SELLMAN, B. N79-32610
SEMENIUK, C. N79-32868
SENIW, W. P. N79-32425
SERNA, J. M. N79-32808
SEVERE, W. R. N79-32530
SHALIT, B. N79-32836
SHANDALA, M. G. N79-32827
SHANG, J. S. N79-32510
SHAPIRO, H. M. N79-32902
SHARP, M. K. N79-32682
SHAWCROFT, R. G. N79-33114
SHED, W. N79-32222
SHEIH, C. M. N79-32750
SHELTON, E. M. N79-32381
SHEPHERD, F. G. N79-32770
SHEPHERD, L. N79-32354
SHETTLER, J. A. N79-32229
SHEVCHENKO, V. S. N79-33124
SHIELDS, R. A. N79-32969
SHIMANSKY, R. A. N79-32217
SHIN, B. K. N79-32667
SHINNAKA, S. N79-32462
SHIRATORI, M. N79-32598
SHIRLEY, T. F. N79-32771
SHKOLNIKOVA, S. I. N79-33143
SHOCKEY, D. A. N79-32364
SHOOTER, J. A. N79-32970
SHUCHMAN, R. N79-32615
SIDWELL, L. B. N79-32635
SIEMANN, H. N79-32246
SIH, G. C. N79-32276
SILLCOX, R. N79-32821
SIMMONDS, M. B. N79-32429
SIMON, M. N79-32228
SIMON, P. C. N79-32766
SINCLAIR, J. B. N79-32888
SINCLAIR, S. R. M. N79-32198
SINGLETON, D. G. N79-32421
N79-32773
SINNOTT, J. N79-32707
SIROHI, V. P. N79-32382
SITES, J. N79-33088
SKEDZELESKI, S. K. N79-32863
SKINNER, F. L. N79-32413
SLATTERY, J. C. N79-32620
SLUNGA, R. N79-32782
SMEDA, M. S. N79-32790
SMITH, F. N79-32428
SMITH, J. C. N79-33022
SMITH, M. A. N79-32258
SMITH, M. C. N79-32679
SMITH, P. D. N79-32477
N79-32519
SMITH, S. P. N79-33135
SMITH, T. N79-32337
SMOORENBURG, G. F. N79-32829
N79-32843
SMYRL, W. H. N79-32683
SNOW, W. N79-32230
N79-32231
N79-32232
SNYDER, H. L. N79-32614
SOBIESKI, P. N79-32447
SOBON, L. E. N79-32237
SOEDERLIND, G. N79-32941
SOEDERQVIST, R. N79-32286
SOICHER, H. N79-32187
SONG, D. N79-32823
SOOHOO, J. N79-32538
SORVARI, J. M. N79-32772
SOTO, J. L. N79-33095
SPANGLER, J. D. N79-32774
SPENCER, R. S. N79-32217
SPERLING, E. N79-32550
SPIETH, H. N79-32265
SPRING, S. C. N79-32199
SPURLOCK, J. N79-32226
N79-32227
SRIDHARAN, R. N79-32425
STALLINGS, D. W. N79-32257
STANG, L. V. N79-32718
STATLER, R. L. N79-32656
STEELE, H. N79-32632
STEENBERGEN, C. N79-32825
STEENEKEN, H. J. M. N79-32450
N79-32451

STEIN, D. L. N79-32975
STEINHAUSER, F. N79-32976
STENEHJEM, E. J. N79-32360
STENNING, N. V. N79-32249
STEPHENS, M. M. N79-32699
STERMAN, L. N79-32885
STEWART, G. W. N79-32530
STILLMAN, G. E. N79-33111
STIMPSON, L. D. N79-32311
STIRN, R. J. N79-33087
STOCKTON, J. R. N79-32369
STOLLER, H. M. N79-32667
STORTI, G. N79-32860
STOUT, D. W. N79-32820
N79-32652
STRAWE, D. F. N79-32415
STRAZISAR, V. N79-32416
STROHL, A. N. N79-32441
STROMAN, M. M. N79-32430
STUART, D. G. N79-32296
STUBBS, T. N79-32549
STUENZI, W. N79-32702
N79-32777
N79-32304
N79-32305
STULLICH, T. W. N79-32517
STURMAN, J. C. N79-32467
STUTZMAN, W. L. N79-32442
SUCCI, G. P. N79-32210
SUGIHARA, R. N79-33033
SUITS, G. N79-32615
SULLIVAN, B. J. N79-32567
SULLIVAN, B. M. N79-32969
SUMMA, T. M. N79-32174
SUMMERS, W. K. N79-32616
SUN, C. T. N79-32272
SUNYAEV, R. A. N79-33124
SURKEIN, M. N79-32328
SURYANARAYANAN, K. N79-32168
SUSSMAN, S. S. N79-32695
SVENSSON, P. N79-33104
SVOBODOVA, L. N79-32879
SWARTZ, B. N79-32913
SWARTZ, C. K. N79-32658
N79-32660
N79-32665
SWEAN, T. F. N79-33042
SWEENEY, M. A. N79-33005
SWITZER, P. N79-32749
SYLVESTER, J. G. N79-33067
SYMES, W. N79-32923

T

TABAKOFF, W. N79-32212
TALUG, A. N79-32273
TANTRAPORN, W. N79-32471
TANZILLI, R. A. N79-33019
TARTAR, L. N79-32918
TAYLOR, C. N79-32420
TAYLOR, D. M. N79-32822
TEENER, M. D. N79-32259
TELFER, D. J. N79-32611
TELK, C. L. N79-32538
TEZAK, E. G. N79-32967
TEZDUYAR, H. T. N79-32572
THALHAMMER, E. D. N79-32703
THIRUVENGADAM, A. P. N79-32564
THOMA, G. R. N79-32455
THOMAS, C. C., JR. N79-32530
THOMPSON, D. O. N79-32563
THOMPSON, J. E., JR. N79-32851
THOMPSON, M. D. N79-33074
THOMPSON, R. E. N79-33022
THOMSON, K. D. N79-32160
THRANE, E. V. N79-32791
THUELLER, G. N79-32764
TIPNIS, P. N79-32386
TORNALLYAY, A. N79-32161
TOTH, L. R. N79-32369
TOTH, W. J. N79-32739
TOWNER, L. E. N79-32881
TOWNSEND, D. P. N79-32552
TRABOLD, E. N79-32265
TRATZ, W. M. N79-32822
TRIEBEL, C. F. N79-32468
TROMP, P. J. N79-32350
TROVILLION, T. A. N79-33036
TSE, M. F. N79-32355
TSO, F. K. W. N79-32590
TSURUBUCHI, S. N79-33034
TURCHI, P. J. N79-33038
N79-33046
TURCK, B. N79-32481
TURNER, H. N. N79-32771
TURNER, J. F., JR. N79-32626

U

UCHIYAMA, N. N79-32168
UHM, H. S. N79-33039
URAMOTO, J. N79-32975
URI, N. N79-32976

V

VAJK, J. P. N79-32229
VANBEEK, H. F. N79-33144
VANDENASSEM, D. N79-32284
N79-32285
VANDENAVYLE, J. A. N79-32340
VANDENBERG, B. N79-32176
N79-32519
VANDENWILT, M. N79-32191
VANDERVORST, A. N79-32447
VANDERZIEL, A. N79-33080
VANEGMOND, J. A. N79-32180
VANGILS, J. N. N79-33144
VANHEEK, K. H. N79-32394
VANHEES, R. M. N79-33144
VANHEUSDEN, E. N79-32829
VANINGENSCHENAU, H. A. N79-32623
VANLAETHEM-MEUREE, N. N79-32766
VANLEEUWEN, H. P. N79-32346
N79-32347
N79-32351
N79-32595
VANWOERKOM, P. T. L. M. N79-32260
N79-32261
VERONDA, C. M. N79-32196
VINZ, P. N79-32730
VITALE, G. N79-32668
VLEGHERT, J. P. K. N79-32214
VOLLAND, H. N79-32248
VONHALLE, E. N79-32504
VOOK, F. L. N79-32341
N79-33055
VORA, H. N79-32546
VRABEL, M. J. N79-32427
VREEBURG, J. P. B. N79-32254
VUDALI, T. N79-32487

W

WACKERLE, J. N79-32377
WAFFENSCHMIDT, E. N79-32247
WAGENAAR, W. A. N79-32837
WAGNER, H. N79-32246
WAGNER, U. N79-32488
WAHL, G. N79-32486
WAIBEL, R. T. N79-32380
WALKER, D. N79-32195
WALKER, D. H. N79-32656
WALKER, F. E. N79-32659
WALKER, G. H. N79-32663
WALKER, J. F. N79-32999
WALL, W. F. N79-32349
WALLENIUS, K. T. N79-32949
WANG, J. N79-32632
WANG, K. C. N79-32507
WANG, K. L. N79-32662
WANG, T. S. N79-32896
WANHILL, R. J. H. N79-32283
N79-32288
N79-32344
N79-32345
N79-32595
N79-32596
N79-32597
N79-32418
N79-32948
N79-32324
N79-32607
N79-32468
N79-33086
N79-32616
N79-32590
N79-32486
N79-32658
N79-32660
N79-32630
N79-32631
N79-32338
N79-32739
N79-32327
N79-32649
N79-32658
N79-32539
WAPELHORST, L. N79-32185
WARDROP, R. L. N79-32632
WARREN, J. R. N79-32242
WATSON, K. N79-32379
WEBB, R. C. N79-32748
WEBER, J. N79-32750
WEBER, P. A. N79-33109
WEED, R. A. N79-33110
WEIMANN, K. N79-32198
WEINBERG, I. N79-32655
N79-32500
WEISS, R. S. N79-32834
N79-32835
WEISS, V. N79-32655
WEISSBROD, R. S. P. N79-33093
WEISSMAN, S. N79-33047
WEIZER, V. G.
WELLS, W.
WEMPE, T. E.
WEN, L.
WENZEL, K. P.
WEPFER, W.
WESELY, M. L.
WESSON, L.
WEST, T. C.
WESTBROOK, R. D.
WESTON, R. P.
WEWERINKE, P. H.
WHITE, C. W.
WHITLOCK, R. R. N79-33031
N79-32618
WHITTY, W. J. N79-32998
WHYTHE, D. J. N79-32404
WICKSTROM, R. A. N79-33082
WIDDEL, H. U. N79-32253
WIEGAND, C. L. N79-32606
WIESNET, D. R. N79-32603
WIGGENRAAD, J. F. M. N79-32594
WILBANKS, T. J. N79-32677
WILCOX, D. C. N79-32554
WILEY, M. L. N79-32402
WILHJELM, J. N79-32785
WILKINSON, J. H. N79-32907
WILLIAMS, J. C. N79-32330
WILLIAMS, R. J. N79-32239
N79-32240
N79-32241
WILLIAMS, R. T. N79-32807
WILLIAMS, V. T. N79-32437
WILSDEN, D. J. N79-32219
WILSON, D. W. N79-32574
WILSON, G. H. N79-32560
WILSON, G. W. N79-32199
WILSON, [illegible] N79-32754
WILSON, S. R. N79-33093
WIMBUSH, W. L. N79-33073
WINKELSTEIN, R. A. N79-32408
WINNINGHAM, J. D. N79-32770
WINSTON, H. N79-33018
WIRTH, M. C. N79-32510
WISE, G. L. N79-32433
WISE, J. N79-32642
WISEMAN, R. L. N79-32196
WISEMBERG, J. N79-32766
WISSMAN, D. N79-32833
WITALIS, E. A. N79-33063
WITCOFSKI, R. D. N79-32637
WITHERSPOON, P. A. N79-32684
WITTENBERG, L. J. N79-32680
WOHLGEMUTH, J. N79-32652
WOLF, D. N79-32730
WOLF, M. N79-32645
WOLF, N. O. N79-33092
WOLFF, U. N79-32445
WONG, L. H. N79-32356
WONG, V. S. W. Y. N79-32894
WOOD, R. F. N79-32655
WOODRUFF, R. R. N79-32832
WOODWARD, F. A. N79-32174
WORKHOVEN, R. M. N79-32681
WORTENDYKE, D. R. N79-32457
WORTMAN, D. E. N79-32542
WRICK, V. L. N79-33082
WRIGHT, J. N79-32544
WRIGLEY, C. N79-32652
WU, A. N79-32338
WU, A. Y. N79-32874
WU, C. P. N79-33089
WU, E. M. N79-32275
WU, J. M. N79-32168
WU, L. T. N79-32876

Y

YAMANAKA, K. N79-33033
YANG, J. N79-32824
YEAGER, L. L. N79-32564
YEIN, F. N79-32823
YEOMAN, J. C., JR. N79-32711
YIP, T. Q. N79-33043
YONAS, G. N79-33056
YOON, C. J. N79-32407
YOST, B. T. N79-32994
YOTILA, Y. A. N79-32768
YOUNG, D. L. N79-32369
YOUNG, F. C. N79-33047
YOUNG, R. T. N79-32655
YU, J. N79-32322
YU, K. N79-32739
YU, N. N79-32202
YU, S. P. N79-32471
YUDOW, B. D. N79-32707
YUN, Y. H. N79-33089
YUREK, G. J. N79-32308

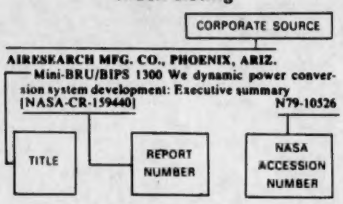
Z

ZAIDER, M. N79-32989
ZANDBERGEN, T. N79-32177
ZANDONELLA, A. N79-32609
N79-32610
ZANNER, F. J. N79-32342
ZANNETTI, P. N79-32749
ZANTOPULOS, H. N79-32548
ZEHR, S. W. N79-32673
ZENGER, M. N79-32488
ZERRWECK, D. N79-32483
ZERZAN, J. M. N79-32684
ZIERL, I. N79-33151
ZWAAN, R. J. N79-32731
ZWICKER, H. N79-33059
N79-33060
N79-33061

CORPORATE SOURCE INDEX

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS VOLUME 17 NUMBER 23

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

ACADEMY OF SCIENCES (USSR), MOSCOW.
The magnetic field structure on the magnetosphere boundary
(PR-440) N79-32781
Observations on V1357 Cyg = Cyg X-1. The search for the optical radiation of the accretion disk
(PR-408) N79-33124
The mapping of Martian soil density. A comparison of albedo, topography, and geology
(PR-417) N79-33142
Simulation of cometary magnetic tails
(PR-439) N79-33143

ADMINISTRATIVE SCIENCES CORP., ALEXANDRIA, VA.
Navy air-launched missile operating and support cost estimating model
(AD-A069527) N79-32251

AEG-TELEFUNKEN, HEILBRONN (WEST GERMANY).
PNP: planar transistor technology
(BMFT-FB-T-78-20) N79-32483

AERONAUTICAL RESEARCH INST. OF SWEDEN, STOCKHOLM.
Fatigue testing of titanium 6Al4V
(FFA-TN-HU-1993) N79-32348

AERONAUTICAL RESEARCH LABS., MELBOURNE (AUSTRALIA).
Low pass filtering of data recorded on magnetic tape in frequency modulated form
(ARL-MECH-ENG-NOTE-373) N79-32527

AERONUTRONIC FORD CORP., NEWPORT BEACH, CALIF.
Pressure gradient effects on supersonic boundary layer turbulence
(AD-A070254) N79-32167

AEROSPACE CORP., EL SEGUNDO, CALIF.
Solar Heating And Cooling Of Buildings (SHACOB): Requirements definition and impact analysis
(EPRI-ER-808-SY) N79-32687

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
Combined discrete network: Continuous control modeling of man-machine systems
(AD-A071574) N79-32842

AIR FORCE AERO PROPULSION LAB., WRIGHT-PATTERSON AFB, OHIO.
Solar photovoltaic research and development program of the Air Force Aero Propulsion Laboratory N79-32642
A review of Air Force high efficiency cascaded multiple bandgap solar cell research and development N79-32670

AIR FORCE FLIGHT DYNAMICS LAB., WRIGHT-PATTERSON AFB, OHIO.
Aerodynamic heating in the fin interaction region of generalized missile shapes at Mach 6 (modular missile test program)
(AD-A071573) N79-32173
Factor of safety - USAF design practice
(AD-A070237) N79-32183
X-ray diffraction measurements of crack tip stresses as a crack advances through a single overload affected zone
(AD-A070193) N79-32588

AIR FORCE HUMAN RESOURCES LAB., BROOKS AFB, TEX.
Pilot performance in simulated aerial refueling as a function of tanker model complexity and visual display field-of-view
(AD-A070231) N79-32832

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.
Prediction of aerodynamic forces on a circular cylinder and a thin airfoil in a transonic airstream by the finite element method
(AD-A070663) N79-32171
An investigation of flame stability in a coaxial dump combustor N79-32209
An experimental evaluation of a laser velocimeter by the study of turbulence in a plane free jet at high subsonic velocities
(AD-A070102) N79-32502
Sixth order analyses of closure in a cracked-elastic-plastic plate
(AD-A070466) N79-32586

AIR FORCE ROCKET PROPULSION LAB., EDWARDS AFB, CALIF.
An application of the theory of materials with variable bonding to solid propellant
(AD-A070188) N79-32370

AIR WEATHER SERVICE, SCOTT AFB, ILL.
Proceedings of the 8th Technical Exchange Conference
(AD-A070009) N79-32806

AKRON UNIV., OHIO.
Epimerization of isotactic polystyrene N79-32354
Structure-property relations of elastomeric ABA triblock copolymers N79-32355
Pneumatic atomization of viscoelastic fluids N79-32493
Stability of density waves in two-phase flow systems N79-32496
A mathematical analysis of the rotary piercing process N79-32548

ALUMINUM CO. OF AMERICA, ALCOA CENTER, PA.
Selecting aluminum alloys to resist failure by fracture mechanisms
(ALCOA-57-77-24-REV) N79-32323

AMERICAN POWER JET CO., RIDGEFIELD, N.J.
Technology trends and maintenance workload requirements for the A-7, F-4, and F-14 aircraft
(AD-A070036) N79-32153

AMES LAB., IOWA.
Kinetic models for irreversible processes on a lattice
(IS-T-850) N79-33092

ANALYTICAL METHODS, INC., BELLEVUE, WASH.
Helicopter flow field analysis
(AD-A069542) N79-32174

APPLIED PHYSICS LAB., JOHNS HOPKINS UNIV., LAUREL, MD.
The effects of the troposphere on Doppler-navigated station positions
(AD-A070184) N79-32188
Energy programs at the Johns Hopkins University Applied Physics Lab.
(PB-295439/4) N79-32739

APPLIED PHYSICS LAB., JOHNS HOPKINS UNIV., SILVER SPRING, MD.
High speed, glitch-free digital to analog converter
(NASA-CASE-GSC-12319-1) N79-32852

ARGONNE NATIONAL LAB., ILL.
Square function analysis of the inductor-converter bridge
(ANL/FPP/TM-118) N79-32482
Micellar/polymer floods for enhanced oil recovery: A review of displacement mechanisms and their simulation
(ANL/ES-74) N79-32620
Energy and cost calculations. 1: Optimization of electrochemical processes to achieve minimum product cost and the impact on energy consumption
(ANL/OEPM-78-2) N79-32697
Survey of biomedical and environmental data bases, models, and integrated computer systems at Argonne National Laboratory
(ANL/ES-65) N79-32745
Recent measurements of the rates of ozone removal from the atmosphere by land surfaces
(CONF-780636-11) N79-32748
Guide for estimating dry deposition velocities of sulfur over the eastern United States and surrounding regions
(ANL/RER-79-2) N79-32750

ARINC RESEARCH CORP., ANNAPOLIS, MD.
Avionics cost development for use of Loran-C navigation systems by low performance general-aviation aircraft
(AD-A068268) N79-32206

ARIZONA STATE UNIV., TEMPE.
Combined photovoltaic/thermal system studies
(SAND-78-7031) N79-32691
Urbanization and its effects on the climate of Phoenix N79-32740
A simulation technique for enhancing CODASYL database implementations N79-32850
The visual and near infrared spectrum of methane and its application to Uranus, Neptune, Triton and Pluto N79-33119

ARIZONA UNIV., TUCSON.
The design and implementation of a goal-directed programming language N79-32866

ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND, DOVER, N. J.
The response of germanium to large amplitude shock waves
(AD-A070454) N79-33079

ARMY AVIATION ENGINEERING FLIGHT ACTIVITY, EDWARDS AFB, CALIF.
Preliminary airworthiness evaluation CH-47C with fiberglass rotor blades with T55-L-712 engines
(AD-A069891) N79-32199

ARMY COMMUNICATIONS RESEARCH AND DEVELOPMENT COMMAND, FORT MONMOUTH, N. J.
Prediction of transionospheric signal time delays at widely separated locations using correlative techniques
(AD-A070538) N79-32187

ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND, WHITE SANDS MISSILE RANGE, N. MEX.
Meteorological rocket network system reliability
(AD-A070187) N79-32808

ARMY MATERIALS AND MECHANICS RESEARCH CENTER, WATERTOWN, MASS.
Experimental evaluation of peak height approximation for X-ray diffracted integrated intensity method
(AD-A070800) N79-32329

ARMY MISSILE RESEARCH AND DEVELOPMENT COMMAND, REDSTONE ARSENAL, ALA.
Flight test results of a virtual image, pantograph mounted, control and display station
(AD-A070290) N79-32207
Noise in coherent optical systems: Minimum detectable object contrast and speckle smoothing
(AD-A070040) N79-33014

ARMY RESEARCH INST. FOR THE BEHAVIORAL AND SOCIAL SCIENCES, ALEXANDRIA, VA.
Algebraic systems: Applications in the behavioral and social sciences
(AD-A070103) N79-32966

ARMY TRAINING AND DOCTRINE COMMAND, FORT MONROE, VA.
Navstar-Global Positioning System (GPS) Army User Equipment (AUE) Required Operational Capability (ROC)
(AD-A070139) N79-32189
ARMY TROPIC TEST CENTER APO, MIAMI 34004.
Methodology investigation. Moisture and temperature conditions in storage containers in humid environments
(AD-A071134) N79-32561
ARO, INC., ARNOLD AIR FORCE STATION, TENN.
A correlation of artificially induced boundary-layer transition data from blunt slender cones at hypersonic speeds
(AD-A070446) N79-32165
Heat-transfer measurements on a 5-deg sharp cone using infrared scanning and on-board discrete sensor techniques
(AD-A070363) N79-32169
A vortex lattice technique for computing ventilated wind tunnel wall interference
(AD-A070445) N79-32220
Tunnel 16T performance: Two-and three-stage compressor performance
(AD-A070191) N79-32221
An experimental investigation of the acoustic characteristics of a variety of slot baffle configurations for transonic wind tunnel walls
(AD-A070261) N79-32223
Data verification tests of a 0.03-scale NASA space shuttle launch vehicle at Mach numbers from 0.60 to 1.55
(AD-A070442) N79-32256
Space shuttle external tank instrumentation evaluation
(AD-A070443) N79-32257
Vorticity-stream function formulation of compressible and incompressible turbulent flows
(AD-A070043) N79-32501
ASTRONOMICAL INST., UTRECHT (NETHERLANDS).
Solar MeV protons recorded during experiment S 99 on board ESRO-4 in 1973
(ESA-STR-203) N79-33144
ATLANTIC SCIENTIFIC CORP., INDIAN HARBOUR BEACH, FLA.
An investigation into the noise interference problems at Logan Airport, Boston
(AD-A072057) N79-32417
ATMOSPHERIC SCIENCES LAB., WHITE SANDS MISSILE RANGE, N. MEX.
The 14818C Lance, missile number 3398, round no. 328 APT
(AD-A070489) N79-32809
ATOMIC ENERGY OF CANADA LTD., PINAWA (MANITOBA).
Long-term storage of irradiated CANDU fuel under water
(AECL-6313) N79-32999
Management of radioactive fuel wastes: The Canadian disposal program
(AECL-6314) N79-33000
Risk assessment for radioactive waste disposal
(AECL-6322) N79-33001
AUSTRIAN SOLAR AND SPACE AGENCY, VIENNA.
Meteorological data for solar energy applications
N79-32733
AVCO LYCOMING DIV., STRATFORD, CONN.
Development of spiral-groove self-acting seals for helicopter engines
(NASA-CR-159622) N79-32551

B

BARI UNIV. (ITALY).
The dynamic analysis of structures: A comparison between two different versions of STRUDL 2
N79-32599
BATTELLE COLUMBUS LABS., OHIO.
Collected engineering data sheets, Air Force data sheet program
(AD-A070665) N79-32201
Sugar crops as a source of fuels. Volume 2: Processing and conversion research
(TID-29400-2) N79-32389
Multifrequency eddy current inspection for cracks under fasteners, phase 2
(AD-A071102) N79-32560
A survey of packaging for solidified low-level radioactive waste
(PB-295038/4) N79-33011
BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH.
Systems analysis of solar thermal power systems. Report on task 1: Determination and characterization of solar thermal conversion options
(PNL-2693) N79-32692
Effects of noncontact cleaners on transparent solar materials
(PNL-2969) N79-32709
Review of unfolding methods used in the US and their standardization for dosimetry
(BNWL-SA-6503) N79-32828
Summary of national and international radioactive waste management programs
(PNL-2941) N79-32995
BENDIX CORP., KANSAS CITY, MO.
LSI process development
(BDX-613-2138-REV) N79-32478
BENTON CORP., MANOR, PA.
Design fabrication and installation of a yaw measuring device
(NASA-CR-161300) N79-32526
BERGBAU-FORSCHUNG G.M.B.H., ESSEN (WEST GERMANY).
Research and development concerning steam gasification of coal: Report on the concept of a prototype plant using nuclear processing heat
(BMFT-FB-T-78-29) N79-32394
BINARY SYSTEMS, INC., SALIDA, COLO.
Further results on an array design to measure the wavenumber-frequency spectrum beneath an axisymmetric turbulent boundary layer
(AD-A071048) N79-32505
BIPHASE ENERGY SYSTEMS, INC., SANTA MONICA, CALIF.
Analysis of two-phase flow in nozzles and turbine buckets
(AD-A070754) N79-32506
BOEING AEROSPACE CO., SEATTLE, WASH.
The transonic oscillating flap
(AD-A070022) N79-32200
Transonic wing redesign using a generalized fictitious gas method
(AD-A070013) N79-32202
CO2 laser annealing of 50-microns-thick silicon solar cells
N79-32659
BOEING CO., SEATTLE, WASH.
Investigation of penetration of electromagnetic energy through joints in advanced composite structures
(AD-A069589) N79-32441
BOEING COMMERCIAL AIRPLANE CO., SEATTLE, WASH.
Time history solution program, L225 (TEV126). Volume 1: Engineering and usage
(NASA-CR-2859) N79-32161
Random harmonic analysis program, L221 (TEV156). Volume 2: Supplemental system design and maintenenace document
(NASA-CR-2858) N79-32162
A program to compute three-dimensional subsonic unsteady aerodynamic characteristics using the doublet lattic method, L216 (DUBFLX). Volume 1: Engineering and usage
(NASA-CR-2849) N79-32163
Modal interpolation program, L215 (INTERP). Volume 1: Engineering and usage
(NASA-CR-2847) N79-32164
BOLT, BERANEK, AND NEWMAN, INC., CAMBRIDGE, MASS.
Command and control related computer technology: Packet radio
(AD-A070447) N79-32430
BONN UNIV. (WEST GERMANY).
A photoconductive detector for the middle infrared
(BMFT-FB-W-78-32) N79-32532
BRAUN (C. F.) AND CO., ALHAMBRA, CALIF.
Fixed bed methanation processes
(FE-2240-96) N79-32382
BRITISH BROADCASTING CORP., KINGSWOOD (ENGLAND).
Channel Islands television programme links: The design of a uhf feed antenna for a 9.14m diameter paraboidal reflector
(BBC-RD-1979/12) N79-32403
Modulation-delay equalisation applied to common-frequency h.f. circuits: An assessment of the likely improvement
(BBC-RD-1979/13) N79-32404
Digital recording using hologram arrays: Optical design for an experimental 100 Mbit/s recorder
(BBC-RD-1979/14) N79-32523
A multichannel digital sound recorder
(BBC-RD-1979/15) N79-32524
BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Performance of ceramic materials in high temperature steam and hydrogen
(BNL-25812) N79-32367
Metal hydride technology
(BNL-26047) N79-32387
Advanced synfuel production with fusion
(BNL-26130) N79-32388
Experimental performance study of a series solar heat pump
(BNL-25928) N79-32704
Avoiding future health problems related to solar energy (photovoltaic) technology
(BNL-25935) N79-32718
Systems framework for energy analysis in developing countries
(BNL-25933) N79-32722
BROWN, BOVERI UND CIE, A.G., HEIDELBERG (WEST GERMANY).
Technology of interfaces on silicate glass passivated semiconductor power devices
(BMFT-FB-T-78-40) N79-32486
BROWN, BOVERI UND CIE, A.G., MANNHEIM (WEST GERMANY).
Tests on a 50tera neutron generator
(BMVG-FBWT-78-14) N79-33006
BROWN UNIV., PROVIDENCE, R. I.
Capacitance transients in p-type GaAs MOS structures and application to lifetime mapping during solar cell fabrication
N79-32668
Available work in geothermal energy
(COO-4051-25) N79-32685
Geothermal power plants of the Soviet Union. A technical survey of existing and planned installations
(COO-4051-41) N79-32686
Numerical methods and approximation and modelling problems in stochastic control theory
(AD-A070038) N79-32898
Thermodynamic and transport properties of isobutane: A survey of available data
(COO-4051-35) N79-33096
BUREAU OF MINES, WASHINGTON, D. C.
Efficiency of tandem solar cell systems as function of temperature and solar energy concentration ratio
N79-32671

C

CALIFORNIA INST. OF TECH., PASADENA.
Discontinuous deformation gradients in plane finite elastostatics of incompressible materials. 1: General considerations. 2: An example
N79-32571
Seismological studies using observed and synthetic waveforms
N79-32757
Steady capillary-gravity waves on deep water
N79-32759
Theoretical investigations of experimental gravitation
N79-32761
Computational structures for extracting edge features from digital images for real-time control applications
N79-32894
Unitary block diagonalization and the characteristic polynomial of a pencil generated by Hermitian matrices
N79-32902
Horizontal Bloch line motion in magnetic bubble materials
N79-33068
Sputtering of insulators in the electronic stopping region
N79-33070
Studies of noble gases in meteorites and in the earth
N79-33135
Analysis of small scale lunar gravity anomalies: Implications for crater formation and crustal history
N79-33136
Observations of 1-6 MeV Jovian electrons at 1 AU and a study of their propagation
N79-33137
CALIFORNIA UNIV., BERKELEY.
Some memorable incidents in probabilistic/statistical studies
(AD-A070023) N79-32947
CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Reduction of nitric oxide by carbon monoxide over a silica supported platinum catalyst: Infrared and kinetic studies
(LBL-8007) N79-32312
Rules and procedures for the design and operation of hazardous research equipment
(PUB-3001) N79-32397
PEP laser surveying system
(LBL-8412) N79-32545
Description of the 3-dimensional 2-phase simulator SHAFT78 for use in geothermal reservoir studies
(LBL-8802) N79-32684
Spectral measurements of infrared sky radiance
(LBL-8778) N79-32776
Vibrational energy transfer in selectively excited diatomic molecules
(LBL-8208) N79-32987
Electrons and kaons in charmed particle decays
(LBL-9017) N79-33003
Ion beam production in the plasma focus device
(UCRL-81962) N79-33053
CALIFORNIA UNIV., DAVIS.
Flow and failure behavior of fiber-reinforced epoxy matrix polymeric composites
(UCRL-13895) N79-32279
CALIFORNIA UNIV., IRVINE.
Low pressure chemical ionization studies using rapid scan ICR spectroscopy
N79-32293

Block implementation of digital filters
N79-32462
Transient behavior of the LMS adaptive filter-response to variable frequency spectral lines
[AD-A070470] N79-32470

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
A high-order theory of laminated plate deformation
N79-32274
Three-dimensional strength characterization of thick composite laminates
N79-32275
Computer automation of continuous-flow analyzers for trace constituents in water. Volume 4: Description of program segments. Part 1: TAAIN
[UCRL-52532-VOL-4-PT-1] N79-32310
Low detonation velocity: High energy explosives
[UCRL-80458] N79-32376
Precision machining versus optical process
[UCRL-82528] N79-32398
Time-dependent FEM solution of the incompressible Navier-Stokes equations in two and three-dimensions
[UCRL-81323] N79-32517
Performance tests of the radial outflow reaction turbine for geothermal applications
[UCID-17902] N79-32693
Demonstration of the capabilities of the Livermore energy policy model
[UCRL-52508] N79-32695
Energy and technology review
[UCRL-52000-79-3] N79-32727
High performance computer systems
[UCID-17914] N79-32891
Properties of multistep amplitudes in charge-exchange reactions
[UCRL-82665] N79-33002
Definition and conceptual design of a small fusion reactor
[EPRI-ER-1045] N79-33004
Materials considerations for Inertially-Confined Fusion Reactors [ICFR]
[UCRL-81206] N79-33049
Design and analysis of isentropic compression experiments
[UCRL-81797] N79-33097
Archival storage requirements
[UCRL-82513] N79-33103

CALIFORNIA UNIV., LOS ANGELES.
Acoustic emission behavior of a low alloy steel
[AD-A069965] N79-32339
Simulation of lower-hybrid heating in a nonuniform plasma slab
[AD-A070491] N79-33041
Microwave experimental simulation of laser plasma interactions
[UCLA-ENG-7931] N79-33051
Optical detection of spectral diffusion of the triplet state zerofield transition energy
[AD-A071179] N79-33084

CALIFORNIA UNIV., SAN DIEGO.
Discrete-time spectral estimation of continuous-time processes: The orthogonal series method spectral estimation by orthogonal series
[AD-A070641] N79-32952

CALIFORNIA UNIV., SANTA BARBARA.
Computer performance measurement tools and techniques
N79-32849
Elements of a theory of computer systems
N79-32890

CALSPAN ADVANCED TECHNOLOGY CENTER, BUFFALO, N. Y.
Theoretical studies of three dimensional transonic flow through a compressor blade row
[AD-A071020] N79-32172

CALSPAN CORP., BUFFALO, N. Y.
Survey and evaluation of potential real-time interactive flight test facilities for the B-1
[AD-A070343] N79-32222

CANADA INST. FOR SCIENTIFIC AND TECHNICAL INFORMATION, OTTAWA [ONTARIO].
Nanogram techniques. 2: Microscale preparative gas chromatography
[NRC/CNR-TT-1951] N79-32304
Nanogram techniques. 1: Injection without losses on capillary columns
[NRC/CNR-TT-1950] N79-32305

CANADIAN COMMERCIAL CORP., OTTAWA [ONTARIO].
Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules
[AD-A070052] N79-32472

CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
Phase transformations in Ti alloys: A review of recent developments
[AD-A070906] N79-32330
Dynamic modeling, simulation and control of ocean thermal energy conversion power plants
N79-32627
On the efficient implementation of production systems
N79-32873
Theory of phase transitions in gases adsorbed on solids
N79-33072

CATHOLIC UNIV. OF AMERICA, WASHINGTON, D. C.
A comparison of verbal and visual imagery learning stategies: Their importance for instrumental technology
[AD-A069983] N79-32833
Analysis of the molecular stuffing strengthening process for glass fiber optical waveguides
N79-33012
Satellite observations of rapidly varying cosmic X-ray sources
N79-33147

CENTRE DE RECHERCHES SCIENTIFIQUES ET TECHNIQUES DE L'INDUSTRIE DES FABRICATIONS METALLIQUES, BRUSSELS [BELGIUM].
Designing tubular heat exchangers using an interactive computer program
[CRIF-MT-131] N79-32521
Stress concentration factors in spheres with radial flush nozzles
[CRIF-MT-129] N79-32601

CENTRE NATIONAL D'ETUDES SPATIALES, TOULOUSE [FRANCE].
A computer method for calculating the radiative interchange factors in a complex enclosure and an extension of the method to the calculation of the incident flux distribution
[CNES-NT-89] N79-32520

CHALMERS UNIV. OF TECHNOLOGY, GOTEBORG [SWEDEN].
A class of finite element methods for advection-diffusion problems with small diffusion
[CTH-79.01-R] N79-32929
Integral kernels and approximation on totally real submanifolds of vector space exponent n
[CTH-MATH-1979-1] N79-32930
Analytic approximation of concave functions
[CTH-MATH-1979-2] N79-32931
On recurrence of a random walk in the plane
[CTH-MATH-1979-4] N79-32932
A proposal for the use of new parallel multiplication and division algorithms, modeled after Egyptian and Babylonian prototypes
[CTH-MATH-1979-5] N79-32933
A new proof of a Muentz-type theorem of Korevarr and Dixon
[CTH-MATH-1979-7] N79-32934
A deterministic model in biomathematics. Asymptotic behavior and threshold conditions
[CTH-MATH-1979-8] N79-32935
Approximation of e exponent -x by rational functions with concentrated negative poles
[CTH-MATH-1979-9] N79-32936
On coupling of continuous time renewal processes
[CTH-MATH-1979-11] N79-32937
A stagewise directional test based on T statistics
[CTH-MATH-1979-3] N79-32957

CHICAGO UNIV., ILL.
Internal energy transfer in isolated molecules: Ergodic and nonergodic behavior
[AD-A071021] N79-32984

CINCINNATI UNIV., OHIO.
Flow in nonrotating passages of radial inflow turbines
[NASA-CR-159679] N79-32212
Automated geometry optimization for ground states of molecules
N79-32977

CITY UNIV. OF NEW YORK, N. Y.
Study of the inhomogeneous electron gas at surfaces
N79-33069

CLARKSON COLL. OF TECHNOLOGY, POTSDAM, N.Y.
A survey of LSI test methodology
[AD-A070733] N79-32476

CLEMSON COLL., S.C.
A Monte Carlo comparison of some ridge and other biased estimators
[AD-A069566] N79-32955

CLEMSON UNIV., S.C.
On sums of gamma order statistics with application to the distribution of R squared in best subset multiple regression
[AD-A070025] N79-32949
Estimation of the mean of a normal distribution with singular covariance matrix
[AD-A069565] N79-32956

COLORADO STATE UNIV., FORT COLLINS.
Dielectrophoretic levitation of spheres and shells
[UCRL-13852-2] N79-32479
Stratified thermal storage in residential Solar energy applications
[COO-4523-1] N79-32682
Radiative transitions induced in GaAs by modest heat treatment
[AD-A071039] N79-33088

COLORADO UNIV., BOULDER.
Quantitative synthesis of multiple loop feedback systems with large uncertainty
[AD-A070273] N79-32896

COLORADO UNIV. AT BOULDER.
Infrared chemiluminescence studies of ion-molecule reactions in a flowing afterglow
[AD-A070068] N79-32309

COLUMBIA UNIV., NEW YORK.
For today: Membrane-produced gasahol. For tomorrow: Membrane-produced alcohol
[PB-295814/8] N79-32395
Damage of metal surfaces by a hot dense deuterium plasma
[COO-4393-03] N79-33057

COMPAGNIA NAZIONALE AEROSPAZIALE S.P.A., ROME [ITALY].
SIRIO 2: Satellite for European Space Agency. Executive summary
N79-32252

COMPTROLLER GENERAL OF THE UNITED STATES, WASHINGTON, D.C.
The 16 air and water pollution issues facing the nation: Appendix to report
[CED-78-148C-APP-1] N79-32742

COMSAT LABS., CLARKSBURG, MD.
Limiting process in shallow junction solar cells
N79-32646

CORNELL UNIV., ITHACA, N. Y.
Deep crustal electrical conductivity in the Adirondacks
N79-32758
Lunar studies
[NASA-CR-162318] N79-33141

CRANFIELD INST. OF TECH., BEDFORDSHIRE [ENGLAND].
The viscoelastic response of composite materials
N79-32268

CRYSTAL SPECIALTIES, INC., MONROVIA, CALIF.
Study Czochralski liquid-seal crystal growing technique
[AD-A070280] N79-33085

D

DAEDALEAN ASSOCIATES, INC., WOODBINE, MD.
Preliminary testing results for the application of a nondestructive evaluation technique utilizing the phenomenon of internal friction for detecting crack formation in a scale model of an offshore structure
[AD-A069535] N79-32564

DANISH METEOROLOGICAL INST., COPENHAGEN.
The relationship between ionospheric and field aligned currents in the dayside cusp
[DMI-GEOPHYS-PAPERS-R-53] N79-32785
Thule geophysical observatory: Magnetic results, 1950
[ISBN-87-7478-135-9] N79-32786
Thule geophysical observatory: Magnetic results, 1951-1952
[ISBN-87-7478-136-7] N79-32787
Thule geophysical observations: Magnetic results, 1955-1956
[ISBN-87-7478-137-5] N79-32788
Rude Skov Geophysical Observatory: Magnetic results, 1977
[ISBN-87-7478-161-8] N79-32789
Summaries of weather observatories at weather stations in Greenland from 1966 to 1970
[ISBN-87-7478-156-1] N79-32813

DANISH RESEARCH CENTER FOR APPLIED ELECTRONICS, HOERSHOLM.
Light emitting diodes. A comparative 10,000 hour service test of light emitting diodes, including 26 variants from 15 manufacturers
[ECR-85] N79-32566

DAYTON UNIV., OHIO.
Software reliability determination and prediction
[AD-A069976] N79-32880

DCW INDUSTRIES, STUDIO CITY, CALIF.
Development of a viscous theory of three-dimensional flow in highly-loaded axial turbomachines
[AD-A071049] N79-32554

DELAWARE UNIV., NEWARK.
Boundary layer effects in composite laminates
N79-32271
Behavior of composite bolted joints at elevated temperature
[NASA-CR-159137] N79-32574

DEPARTMENT OF AGRICULTURE, WESLACO, TEX.
Plant cover, soil temperature, freeze, water stress, and evapotranspiration conditions
[E79-10280] N79-32606

DEPARTMENT OF ENERGY, BARTLESVILLE, OKLA.
Effects of interface conductivity on electric logging in western gas sands: A literature review
[BETC/IC-79/2] N79-32621

DEPARTMENT OF ENERGY, LARAMIE, WYO.
Mathematical model of forward combustion retorting of oil shale
[LETC/TPR-78/1] N79-32375

DEPARTMENT OF ENERGY, LAS VEGAS, NEV.
Nevada nuclear waste storage investigations
[NVO-196-9] N79-32997

DEPARTMENT OF ENERGY, MORGANTOWN, W. VA.
Kinetics and reaction products of aerobic pyrrhotite [FeS] hydrolysis at ambient temperatures
[METC/RI-79/3] N79-32311
DEPARTMENT OF ENERGY, OAK RIDGE, TENN.
Energy information data base. Serial titles
[TID-4579-R-10-SUPPL-1] N79-32721
DEPARTMENT OF ENERGY, WASHINGTON, D. C.
Role of refined product imports in the domestic fuel market
[DOE/EIA-0102/53] N79-32372
Aviation turbine fuels, 1978
[BETC/PPS-79/2] N79-32381
Strategic petroleum reserve
[DOE/TIC-10107] N79-32617
Reexamination of the estimation of undiscovered oil resources in the US
[DOE/EIA-0103/31] N79-32618
Assessment of potential US petroleum supply shortfalls, 1978 - 1980
[DOE/EIA-0102/13] N79-32619
Fossil energy program summary document
[DOE/ET-0067] N79-32696
Energy Emergency Management Information System [EEMIS]: Program plan
[DOE/EIA-0135] N79-32723
Environmental development plan, fossil fuel utilization program
[DOE/EDP-0046] N79-32746
Methods for studying and criteria for evaluating the biological effects of electric fields of industrial frequency
[CONF-780541-1] N79-32827
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, COLOGNE [WEST GERMANY].
Scientific research, 1977
N79-33150
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, OBERPFAFFENHOFEN [WEST GERMANY].
Contributions to the 'Data Systems Engineering in Space Travel' Symposium
[DLR-MITT-78-02] N79-32243
Proposal for an interplanetary mission to sound the outer regions of the solar corona
N79-32248
DORNIER-WERKE G.M.B.H., FRIEDRICHSHAFEN [WEST GERMANY].
Study on expenditure optimization for satellite and Spacelab experiments
[BMFT-FB-W-78-34] N79-32246
Magnetosphere sounding rocket program. A substorm phenomena payload. Report on system design, integration, testing, and flight
[BMFT-FB-W-78-35] N79-32247
Simulation of communications systems for TV transmission, exchange of radio programs, and long-distance telephony
[BMFT-FB-W-78-27] N79-32445
DREXEL UNIV., PHILADELPHIA, PA.
Role of deformation processing on the fatigue behavior of a high strength powder metallurgy aluminum alloy
N79-32318
DUKE UNIV., DURHAM, N. C.
Research Workshop on Mechanics of Composite Materials
N79-32267
Plasticity of composite laminates
N79-32269
DYNAMIC SCIENCE, PHOENIX, ARIZ.
Paratransit vehicle test and evaluation. Volume 2: Acceleration and interior measurement tests
[PB-295476/6] N79-33109
Paratransit vehicle test and evaluation. Volume 5: Noise tests
[PB-295479/0] N79-33110
DYNETICS, INC., HUNTSVILLE, ALA.
Design of IRSS projectors
[AD-A070898] N79-33020

E

EAST-WEST GATEWAY COORDINATING COUNCIL, ST. LOUIS, MO.
Transportation systems management element
[PB-295349/5] N79-33111
ECODYNAMICS RESEARCH ASSOCIATES, INC., ALBUQUERQUE, N. MEX.
Rapid calculation of three-dimensional flows in flush inlets
[AD-A069585] N79-32512
User's manual for codes CHLG and CHTS: Steady incompressible viscous flow in two-dimensional channels
[AD-A069584] N79-32513
Semidirect methods for discretized nonlinear partial differential equations, with particular applications to fluid dynamics
[AD-A069596] N79-32514
EDGERTON, GERMESHAUSEN AND GRIER, INC., LAS VEGAS, NEV.
Measurement system for large motions
[EGG-1183-1634] N79-32777
ELECTRONICS RESEARCH LAB., ADELAIDE [AUSTRALIA].
Predicting transionospheric propagation conditions
[AD-A070283] N79-32421
Ion bombardment of materials containing alkali metals of alkaline earths
[AD-A070284] N79-32541
An improved ionospheric irregularity model
[AD-A070282] N79-32773
A microprocessor based image storage and analysis facility for infrared signature measurement and image processing
[AD-A070288] N79-32858
ENERGY RESOURCES CO., INC., CAMBRIDGE, MASS.
Potential use of wood and agriculture wastes as steam generator fuel for thermal enhanced oil recovery
[SAN-1038-PO-1] N79-32717
ENVIRONMENTAL RESEARCH INST. OF MICHIGAN, ANN ARBOR.
Measurements of bistatic clutter cross section
[AD-A071193] N79-32428
Basic remote sensing investigation for coastal reconnaissance
[AD-A070770] N79-32615
ERIE TECHNOLOGICAL PRODUCTS OF CANADA LTD., TRENTON [ONTARIO].
Manufacturing methods and techniques for miniature high voltage hybrid multiplier modules
[AD-A070052] N79-32472
ERNO RAUMFAHRTTECHNIK G.M.B.H., BREMEN [WEST GERMANY].
Requirements analysis and feasibility study for the Spacelab user program: Supersensitive optical accelerometer
[BMFT-FB-W-78-18] N79-32245
EUROPEAN SPACE AGENCY, NOORDWIKJ [NETHERLANDS].
Microscopic investigation of electrostatic discharge phenomena on nonconductive optical solar reflectors with a conductive adhesive
[ESA-STM-211] N79-32729
EUROPEAN SPACE AGENCY, PARIS [FRANCE].
European space activities
[SP-1014] N79-32242
EXECUTIVE OFFICE OF THE PRESIDENT, WASHINGTON, D. C.
Aeronautics and space report of the President, 1978 activities
N79-33115

F

FEDERAL AVIATION AGENCY, ATLANTIC CITY, N.J.
Calculation of the correlation region size for use with alpha-beta tracking filters
[AD-A072083] N79-32414
Numerical studies of conversion and transformation in a surveillance system employing a multitude of radars, part 2
[AD-A072086] N79-32415
Numerical studies of conversion and transformation in a surveillance system employing a multitude of radars, part 1
[AD-A072085] N79-32416
FEDERAL COMMUNICATIONS COMMISSION, WASHINGTON, D. C.
Microwave applications processing system: A user's guide
[PB-294692/9] N79-32458
FERMI NATIONAL ACCELERATOR LAB., BATAVIA, ILL.
Modular calorimeter system for use in high energy physics
[COO-3071-239] N79-32994
FLACHGLASS A.G. DELOG-DETAG, GELSENKIRCHEN [WEST GERMANY].
Development of an industrial process for the production of indium oxide layers for the improvement of the K-values of insulating glass panes
[BMFT-FB-T-78-34] N79-32282
FLORIDA STATE UNIV., TALLAHASSEE.
Tests for dependence
[AD-A069567] N79-32954
FLORIDA UNIV., GAINESVILLE.
Design of high efficiency HLE solar cells for space and terrestrial applications
N79-32647
Hartmann flows in the MHD generator configuration
[AD-A070080] N79-33036
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME [ITALY].
Advanced training and research on satellite remote sensing techniques and applications in the United Kingdom and the United States, 1 October 1977 to 30 September 1978
[AGLT/RSU-SERIES-2/79] N79-32622
FORD AEROSPACE AND COMMUNICATIONS CORP., PALO ALTO, CALIF.
Lunar building materials: Some considerations on the use of inorganic polymers
N79-32238
FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E. V., KARLSRUHE [WEST GERMANY].
Published patent applications and patents resulting from German government sponsored research and development
[BMFT-FB-T-78-31] N79-33151
FRL - AN ALBANY INTERNATIONAL CO., DEDHAM, MASS.
Kevlar properties investigation development of Kevlar tensile test methods
[AD-A071405] N79-32163

G

GENERAL ACCOUNTING OFFICE, WASHINGTON, D. C.
Centralizing Air Force aircraft component repair in the field can provide significant savings
[PB-295320/6] N79-32154
The multinational F-16 aircraft program: Its progress and concern
[PB-296999/6] N79-33098
GENERAL DYNAMICS CORP., SAN DIEGO, CALIF.
Effect of environmental parameters on habitat structural weight and cost
N79-32228
GENERAL ELECTRIC CO., BINGHAMTON, N.Y.
The 150 KVA samarium cobalt USCF starter generator electrical system
[AD-A070078] N79-32468
GENERAL ELECTRIC CO., LYNN, MASS.
Cast titanium compressor casting
[AD-A071051] N79-32335
GENERAL ELECTRIC CO., PHILADELPHIA, PA.
Advanced optical ceramics, phase I
[AD-A070909] N79-33019
A guide and handbook for using the GE Space/RESD libraries
[DOC-79SDS030] N79-33101
GENERAL ELECTRIC CO., SCHENECTADY, N. Y.
Dynamic effects of avalanche-generated carriers
[AD-A070258] N79-32471
High efficiency cell geometry
N79-32653
GEOLOGICAL SURVEY, DENVER, COLO.
Geologic application of thermal-inertia mapping from satellite
[E79-10282] N79-32607
GEOLOGICAL SURVEY, RESTON, VA.
US Geological Survey sources of photographs and images of biosphere reserves taken from spacecraft and aircraft: Everglades National Park
[PB-296353/6] N79-32624
GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Streamflow simulation studies of the Hillsbrough Alafia, and Anclote rivers, west central Florida
[PB-295569/8] N79-32626
GEOLOGICAL SURVEY, WASHINGTON, D. C.
Georgia from space: An explanation of the NASA LANDSAT 1 satellite image color mosaic of the state of Georgia
[CIRC-787] N79-32613
GEORGE WASHINGTON UNIV., WASHINGTON, D. C.
A program verifier and proof of the correctness of a flight director program
N79-32864
GEORGIA DEPT. OF NATURAL RESOURCES, ATLANTA.
Georgia from space: An explanation of the NASA LANDSAT 1 satellite image color mosaic of the state of Georgia
[CIRC-787] N79-32613
GEORGIA INST. OF TECH., ATLANTA.
Systems engineering overview for regenerative life-support systems applicable to space habitats
N79-32226
A fracture mechanics evaluation of creep induced embrittlement
N79-32570
GOULD INFORMATION IDENTIFICATION, INC., FORT WORTH, TEX.
An 800 MHz communications survey of the Los Angeles area
[PB-295043/4] N79-32456
GULL [CLOYD DAKE] AND ASSOCIATES, INC., KENSINGTON, MD.
National Periodicals Center concept reconsidered: Alternatives and costs
[PB-296351/0] N79-33105

H

HAMPSHIRE COLL., AMHERST, MASS.
Mass drivers. 1: Electrical design
N79-32230

Mass drivers. 2: Structural dynamics
N79-32231
HARRY DIAMOND LABS., ADELPHI, MD.
User's manual for SCWAR: A multiwire shielded cable code for a systems oriented EMP vulnerability assessment program
[AD-A070884] N79-32427
Possible use of two laser beams to determine particle-size distribution
[AD-A070965] N79-32542
HARVARD UNIV., CAMBRIDGE, MASS.
Radio recombination line observations of the ionized gas in the Galactic Center
N79-33125
An optical analysis of dust complexes in spiral galaxies
N79-33129
HAWAII UNIV., HONOLULU.
An assessment of near-earth asteroid resources
N79-32235
HEIMANN G.M.B.H., WIESBADEN [WEST GERMANY].
Development of suitable semi-conductor-evaporated coatings for a color-striped vidicon for a single tube color camera
[BMFT-FB-T-78-39] N79-33025
HELSINKI UNIV. OF TECHNOLOGY, ESPOO [FINLAND].
The effect of a magnesium oxide additive on the reduction of iron oxides
[TKK-V-A3[1978]] N79-32343
HONEYWELL CORPORATE MATERIAL SCIENCES CENTER, BLOOMINGTON, MINN.
Development of fluorides for high power laser optics
[NVO-1555-4] N79-32546
HOUSTON UNIV., TEX.
Application of a structured decision process for proper inclusion of human resources in the design of a power unit support stand
[AD-A069978] N79-32840
Semiclosed operators in Hilbert space
N79-32964
Fourier transform nuclear magnetic resonance spectroscopy applications of chemical interest
N79-32979
HUGHES AIRCRAFT CO., CULVER CITY, CALIF.
Feasibility study of silicon nitride protection of plastic encapsulated semiconductors
[NASA-CR-161302] N79-32266
HUGHES AIRCRAFT CO., EL SEGUNDO, CALIF.
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 1: Study overview and summary
[NASA-CR-162328] N79-32638
Conceptual design study of concentrator enhanced solar arrays for space applications Volume 2: Technical
[HAC-REF-E3256-VOL-2] N79-32639
HUGHES AIRCRAFT CO., MALIBU, CALIF.
Fabrication of high efficiency and radiation resistant GaAs solar cells
N79-32664
HUGHES RESEARCH LABS., MALIBU, CALIF.
Summary of GaAs Solar Cell Performance and Radiation Damage Workshop
N79-32669
Silicon-germanium alloys for infrared detectors
[AD-A070932] N79-33018
Wide bandwidth liquid crystal light valve
[AD-A070675] N79-33083

I

ILLINOIS UNIV. AT CHICAGO CIRCLE, CHICAGO.
Refinement and validation of a three-dimensional head-spin model
[AD-A062502] N79-32826
ILLINOIS UNIV. AT URBANA-CHAMPAIGN.
Limiting mechanisms of dislocation motion in ice
N79-32602
The effect of program behavior upon interleaved memory bandwidth in a multiprocessor environment
[AD-A070115] N79-32855
The study and identification of residual donor species in high purity semiconductors
[AD-A071059] N79-33087
ILLINOIS UNIV., URBANA-CHAMPAIGN.
Source radiation in the presence of convex bodies
[AD-A070827] N79-32440
INDIAN INST. OF TECH., BOMBAY.
Numerical analysis of pressure vessels using various shell theories
[IIT-B/CE-79-1] N79-32576
Numerical analysis of pressure vessels using various shell theories: Introduction
N79-32577
A critical review of relevant literature
N79-32578
Problem formulation
N79-32579
Numerical analysis
N79-32580
Numerical results
N79-32581
Numerical analysis of pressure vessels using various shell theories: Discussions and conclusions
N79-32582
INSTITUT D'AERONOMIE SPATIALE DE BELGIQUE, BRUSSELS.
Long term effect on the ozone layer of nitrogen oxides produced by thermonuclear explosions in the atmosphere
[AERONOMICA-ACTA-A-198-1979]
N79-32763
Comparisons between various semi-empirical thermospheric models of the terrestrial atmosphere
[AERONOMICA-ACTA-A-199-1979]
N79-32764
Aeronomical models of the stratosphere
[AERONOMICA-ACTA-A-202-1979]
N79-32765
Ultraviolet absorption spectrum of methylchloroform in the vapor phase
[AERONOMICA-ACTA-A-203-1979]
N79-32766
Temperature, molecular nitrogen concentration and turbulence in the lower thermosphere inferred from incoherent scatter data
[AERONOMICA-ACTA-A-204-1979]
N79-32767
The effect of solar output, infrared cooling and latitudinal heat transport on the evolution of the earth's climate
[AERONOMICA-ACTA-A-200-1979]
N79-32794
Some evolution and stability trends deduced from energy and water vapor balance models
[AERONOMICA-ACTA-A-201-1979]
N79-32795
INSTITUT FUER ANGEWANDTE GEODAESIE, FRANKFURT AM MAIN [WEST GERMANY].
Numerical solution to the inverse problem of the geodetic ellipsoid of revolution
[SER-B-228-MITT-145] N79-32778
INSTITUT FUER ANGEWANDTE MATERIALFORSCHUNG DER FRAUNHOFER-GESELLSCHAFT E. V., BREMEN [WEST GERMANY].
On the welding of martensitic hardened steels
[BMVG-FBWT-78-17] N79-32556
INSTITUTE FOR PERCEPTION RVO-TNO, SOESTERBERG [NETHERLANDS].
Description of STIDAS 2-c [Speech Transmission Index Device using Artificial Signals]. Part 1: General description
[IZF-1978-19] N79-32450
A physical method for measuring speech-transmission quality
[IZF-1979-1] N79-32451
Effects of acute noise traumata on whole-nerve and single-unit activity
[IZF-1978-23] N79-32829
The use of artificial signals during SONAR-watch
[IZF-1978-25] N79-32837
Car driving as a cybernetic task
[IZF-1979-6] N79-32838
Effects of amphetamine on response selection and response execution processes in choice reaction tasks
[IZF-1978-8] N79-32839
Tentative evaluation of annoyance caused by noise from gunfire
[IZF-1978-21] N79-32843
Applications of the modulation transfer function in room acoustics
[IZF-1978-19] N79-32975
Comparison of some methods for measuring speech levels
[IZF-1978-22] N79-32976
INSTITUTE FOR TELECOMMUNICATION SCIENCES, BOULDER, COLO.
Automated digital system engineering model
[PB-294960/0] N79-32457
INSTITUTE OF GAS TECHNOLOGY, CHICAGO, ILL.
Development of combustion data to utilize low-Btu gases as industrial process fuels. Project 8985 special report no. 3, nozzle-mix burner
[FE-2489-31] N79-32380
Peat gasification: An experimental study
[CONF-780611-8] N79-32391
Production of high-energy chemicals using solar energy heat
[ORNL/SUB-7390/1] N79-32707
INSTITUUT VOOR KERNPHYSISCH ONDERZOEK, AMSTERDAM [NETHERLANDS].
Radioisotope production with electron accelerators
[REPT-78/5] N79-33007
The 500 MeV, 10% d.f. linear accelerator [MEA] under construction at Amsterdam
[REPT-79/1] N79-33008
INTERNATIONAL METEOROLOGICAL INST., STOCKHOLM [SWEDEN].
A bulk model of the atmospheric planetary boundary layer
[DM-28] N79-32790
INTERNATIONAL NUCLEAR ENERGY SYSTEMS CO., ARLINGTON, VA.
Electromagnetic field and mechanical stress analysis code. Appendix A: Preliminary conceptual design study of the riggatron approach to fusion power
[DOE/TIC-4068-T2-APP-A] N79-32443
IRT CORP., SAN DIEGO, CALIF.
Investigation of electron attachment in polyatomic molecules
[AD-A070069] N79-32985
IRVIN INDUSTRIES, INC., GARDENA, CALIF.
Recovery systems design guide
[AD-A070251] N79-32170
ITT ELECTRO-OPTICAL PRODUCTS DIV., ROANOKE, VA.
Low cost fiber optic cable assemblies for local distribution systems
[AD-A070723] N79-33022
Devices for fiber optics communication
[AD-A070746] N79-33023

J

JACOBSON [DONALD M.] LANGUAGE SERVICES, NASHVILLE, TENN.
PCM techniques aid in storing analog data: An exact magnetic-tape storage method for analog measurement signals
[ORNL/TR-4573] N79-32529
JET PROPULSION LAB., CALIF. INST. OF TECH., PASADENA.
Aircraft vortex marking program
[NASA-CR-162299] N79-32156
Round-trip missions to low delta-V asteroids and implications for material retrieval
N79-32233
Experience with fluorine and its safe use as a propellant
[NASA-CR-162296] N79-32369
Baseband signal combiner for antenna array
[NASA-CASE-NPO-14641-1] N79-32408
Evaluation of the JPL X-band 32 element active array
[NASA-CR-162297] N79-32409
Technical assistance for law-enforcement communications: Case study report two
[NASA-CR-162294] N79-32410
Technical assistance for law-enforcement communications: Grant summary
[NASA-CR-162305] N79-32411
Spectral characteristics of convolutionally coded digital signals
[NASA-CR-162295] N79-32412
Characterization of solar cells for space applications. Volume 8: Electrical characteristics of Spectrolab BSF, BSR, textured 290-micron solar cells [K7] as a function of intensity, temperature and irradiation
[NASA-CR-162290] N79-32630
Characterization of solar cells for space applications. Volume 9: Electrical characteristics of Spectrolab BSF, textured, 10-ohm-cm 200-micron cells as a function of intensity, temperature, and irradiation
[NASA-CR-162289] N79-32631
A preliminary assessment of small steam Rankine and Brayton point-focusing solar modules
[NASA-CR-162302] N79-32632
LSA project technology development update
[NASA-CR-162301] N79-32633
Evaluation of cellular glasses for solar mirror panel applications
[NASA-CR-162303] N79-32634
Results of the 1978 NASA/JPL balloon flight solar cell calibration program
[NASA-CR-162298] N79-32635
Stirling laboratory research engine survey report
[NASA-CR-162304] N79-32636
The JPL space photovoltaic program
N79-32643
Electron irradiation of tandem junction solar cells
N79-32657
Effect of dopants on annealing performance of silicon solar cells
N79-32661
Fabrication of high efficiency and radiation resistant GaAs solar cells
N79-32664
Radiation effects in GaAs AMOS solar cells
N79-32667
Microbiological evaluation of the mobile biological isolator system
[NASA-CR-162293] N79-32822
Software design and documentation language, revision 1
[NASA-CR-162291] N79-32875
Models of P/Tempel 2
[NASA-CR-162292] N79-33138
Planetary data system requirements: Multi-mission radio science requirements for the 1978 to 1988 era
[NASA-CR-162306] N79-33139
Nutation of Mars
[NASA-CR-162300] N79-33140

JOHNS-MANVILLE SALES CORP., DENVER, COLO.
Performance evaluation of solar films and screens
[AD-A070039] N79-32674
JOINT CENTER FOR GRADUATE STUDY, RICHLAND, WASH.
Investigation of low cost solar cells based on Cu2O
[PB-295888/2] N79-32737
JOINT INST. FOR ADVANCEMENT OF FLIGHT SCIENCES, HAMPTON, VA.
Acoustic analysis of the propfan
[NASA-CR-162312] N79-32210

K

KANSAS STATE UNIV., MANHATTAN.
Infinite cloud model of electrification by the precipitation mechanism in the presence of high rates of ion generation
[UCRL-13860] N79-32774
KANSAS UNIV., LAWRENCE.
Implementation and evaluation of interval arithmetic software. Report 3: The Honeywell G635 system
[AD-A070374] N79-32878
KENTUCKY UNIV., LEXINGTON.
Some algorithmic problems in linear systems, I
[AD-A070138] N79-32911
Comments on a simple proof of the separation theorem for linear stochastic systems with time delays
[AD-A070272] N79-32946
KING RESEARCH, INC., ROCKVILLE, MD.
Journal in scientific communication: The roles of authors, publishers, libraries and readers in a vital system
[PB-296263/7] N79-33108

L

LAKE CHAMPLAIN BASIN STUDY, BURLINGTON, VT.
Limnology of Lake Champlain
[PB-295612/6] N79-32625
LANCASTER UNIV. [ENGLAND].
Satellite monitoring of sea surface pollution
[E79-10287] N79-32611
LASER DEVELOPMENT CORP., LEXINGTON, MASS.
Development of tunable high pressure CO2 laser for lidar measurements of pollutants and wind velocities, January 1976 to December 1977
[NASA-CR-3175] N79-32540
LASER DIODE LABS., INC., METUCHEN, N. J.
Light emitting diodes for fiber optic communications
[AD-A071158] N79-33021
LEHIGH UNIV., BETHLEHEM, PA.
Three-dimensional laminate plates with through and part-through cracks
N79-32276
Studies in electrochemistry. 1: Microprocessor controlled electrochemistry. 2: Thiamine electrochemical oxidation reactions
N79-32301
Column chromatography of polymer latexes
N79-32352
Linear sweep differential pulse voltammetry: Theory and application
N79-32525
Growth characteristics of a through crack in a plate of finite thickness
N79-32568
Modular calorimeter system for use in high energy physics
[COO-3071-239] N79-32994
LEYBOLD-HOCHVAKUUM-ANLAGEN G.M.B.H., COLOGNE [WEST GERMANY].
Manometers for extremely low pressure
[BMFT-FB-T-78-38] N79-32531
LINCOLN LAB., MASS. INST. OF TECH., LEXINGTON.
Correlation techniques for deep space uncorrelated targets
[AD-A071014] N79-32425
Bistatic scattering reflection asymmetry and polarization reversal symmetry
[AD-A071008] N79-32426
Distributed sensor networks
[AD-A070455] N79-32438
Shallow-homojunction GaAs solar cells
N79-32666
Field tests of photovoltaic power systems
[COO-4094-32] N79-32700
Microprocessor-controlled autonomous sun-following mount for solar photovoltaic energy planning
[COO-4094-34] N79-32702
Atmospheric extinction. 1: Synthetic data
[AD-A071006] N79-32772
Image restoration by short space spectral subtraction
[AD-A070382] N79-33013
Orientation of crystalline overlayers on amorphous substrates by artificially produced surface relief structures
[AD-A071168] N79-33091
LISTER HILL NATIONAL CENTER FOR BIOMEDICAL COMMUNICATIONS, BETHESDA, MD.
Evaluation of echo suppression in video teleconferencing via the communications technology satellite
[PB-294965/9] N79-32455
LITTLE [ARTHUR D.], INC., CAMBRIDGE, MASS.
Energy conservation opportunities in appliances using energy storage
[ORNL/SUB-7303/1] N79-32629
LOCKHEED ELECTRONICS CO., HOUSTON, TEX.
The ecological variations in thermal infrared emissivity of vegetation
[E79-10271] N79-32605
LOCKHEED-GEORGIA CO., MARIETTA.
Estimation of tunnel blockage from wall pressure signatures: A review and data correlation
[NASA-CR-152241] N79-32219
LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.
Cadmium sulfide-copper sulfide heterojunction cell research
[SAN-1459-3] N79-32701
LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Development of a large electrically driven flyer system for explosive initiation studies
[LA-UR-78-2279] N79-32377
Thermoelastic analysis of a superconducting cable
[LA-7465-MS] N79-32477
Energy losses in a flat transposed cable
[LA-7635-MS] N79-32481
Ceramic heat pipes for high temperature heat removal
[LA-UR-79-332] N79-32518
Experience with installation and operation of digital electronic balances
[LA-UR-79-1029] N79-32530
Simulated neutron tomography for nondestructive assays
[LA-UR-79-938] N79-32565
Energy extraction operations: Some preliminary results
[LA-UR-79-679] N79-32678
The future of hot dry rock geothermal energy systems
[LA-UR-79-683] N79-32679
Federal hot dry rock geothermal energy development program: An overview
[LA-UR-79-670] N79-32690
Potential prediction needs in support of energy systems
[LA-UR-79-673] N79-32698
Passive solar heating for buildings
[LA-UR-78-427] N79-32706
Status review of the technology assessment of solar energy program
[LA-UR-79-1369] N79-32714
Small-scale solar simulator for indoor testing of collector modules and materials
[LA-UR-79-1335] N79-32716
Newly discovered failure mode in high energy density, energy storage capacitors
[LA-7376-MS] N79-32728
Coupled neutron and photon cross sections for transport calculations
[LA-7808-MS] N79-32988
Meson factories
[LA-UR-79-1236] N79-32989
Stability of the lanthanide hydrides
[LA-7602-MS] N79-32991
Nuclear safeguards research and development
[LA-7616-PR] N79-32996
Early screening of nuclear waste retrieval and processing alternatives
[LA-UR-78-2412] N79-32998
Some properties of the reverse-field Z-pinch: An overview
[LA-7798-MS] N79-33050
Flux compression generators as plasma compression power sources
[LA-UR-79-1064] N79-33058
LOUISIANA STATE UNIV. AND A&M COLL., BATON ROUGE.
Jamming signal reduction in spread spectrum systems
[AD-A069947] N79-32435
LUNAR SCIENCE INST., HOUSTON, TEX.
The initial lunar supply base
N79-32236
LUND UNIV. [SWEDEN].
The cosmic ray boron and carbon isotopic composition measured in nuclear emulsions
[LUIP-7906] N79-33149

M

M&S COMPUTING, INC., HUNTSVILLE, ALA.
Standalone engine simulator [SAES], Engine Dynamics simulator [EDS] Xerox Sigma 5 interface hardware manual
[NASA-CR-161301] N79-32213
MAN-ACOUSTICS AND NOISE, INC., SEATTLE, WASH.
Commercial aircraft flight deck noise criteria
[AD-A072029] N79-32969
MARQUETTE UNIV., MILWAUKEE, WIS.
Thermodynamic-economic analysis of the synthane process
[COO-4589-1] N79-32379
MARTIN MARIETTA AEROSPACE, ORLANDO, FLA.
Aerodynamic stability technology for maneuverable missiles. Volume 1: Configuration aerodynamic characteristics
[AD-A070250] N79-32250
MARTIN MARIETTA LABS., BALTIMORE, MD.
Unsteady boundary layer separation
[AD-A070742] N79-32507
MARYLAND UNIV., COLLEGE PARK.
The absolute isotopic abundance and atomic weight of thallium
N79-32295
Cellular graph automata
N79-32874
Dependency networks as a representation for modelling in general problem solvers
N79-32889
Algorithms for discovering hierarchical relationships among dichotomous items
N79-32904
Stability properties of a field-reversed ion layer in a background plasma
[AD-A070611] N79-33039
Axially-dependent equilibrium of an unneutralized electron beam in an axial magnetic field
[AD-A070592] N79-33040
Investigation of noise in soilds at low temperatures
[AD-A070016] N79-33086
MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Spatial data management system
[AD-A070243] N79-32853
Decomposition of weighted graphs using the interchange partitioning technique
[AD-A069549] N79-32859
Distributed computer systems: Structure and semantics
[AD-A070286] N79-32879
MASSACHUSETTS UNIV., AMHERST.
Applications of chemical reactions to the determination of trace quantities of organic functional groups
N79-32264
Electroanalytical applications of reticulated vitreous carbon electrodes
N79-32296
Investigation of the liquid-layer-on-solid sample spark technique
N79-32298
A rheo-optical study of the stress-induced crystallization of poly[ethylene terephthalate]
N79-32353
Update synchronization in multiaccess database systems
N79-32845
Segmentation of static and dynamic scenes
N79-32870
On the structures of HII regions and their distribution in the galaxy
N79-33131
MAX-PLANCK-INSTITUT FUER AERONOMIE, KATLENBURG-LINDAU [WEST GERMANY].
Aeronomy sounding rocket program. Results of the guard ring probe experiment flown on the payload B1 of the National Aeronomy Winter Anomaly and Trace Constituents program at El Arenosillo, Spain, between December 1975 and January 1976
[BMFT-FB-W-78-26] N79-32253
MAX-PLANCK-INSTITUT FUER ASTRONOMIE, HEIDELBERG [WEST GERMANY].
The zodiacal light experiment E9 on Helios A and B
[BMFT-FB-W-78-28] N79-33132
MAX-PLANCK-INSTITUT FUER METEOROLOGIE, HAMBURG [WEST GERMANY].
Ocean wave forecasting
[AD-A069469] N79-32819
MAX-PLANCK-INSTITUT FUER PHYSIK UND ASTROPHYSIK, GARCHING [WEST GERMANY].
Calculation and construction of wide band far infrared filters [MPE balloon telescope]
[MPI-PAE/EXTRATERR-146] N79-33024
X-ray optical characteristics of a Wolter telescope
[MPI-PAE/EXTRATERR-146] N79-33123
Investigation of the anomalous component of low energy cosmic rays: Experimental results and a numerical model
[MPI-PAE/EXTRATERR-147] N79-33148
MCDONNELL AIRCRAFT CO., ST. LOUIS, MO.
Multi-element airfoil viscous-inviscid interactions
[NASA-CR-159125] N79-32157

MECHANICAL TECHNOLOGY, INC., LATHAM, N. Y.
Demonstration of a free piston Stirling engine driven linear alternator system
[COO-2764-002] N79-32713
MELBOURNE UNIV., CARLTON [AUSTRALIA].
Recognition of the aircraft navigation light colour code
N79-32186
MEMPHIS STATE UNIV., TENN.
Flexible disk file structures for microcomputer systems
N79-32851
MERCK [E.], DARMSTADT [WEST GERMANY].
Nematic liquid crystals for display systems
[BMFT-FB-T-78-41] N79-32535
MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., MUNICH [WEST GERMANY].
ARIANE Passenger Experiment [APEX]: Planning study
[BMFT-FB-W-77-24] N79-32244
MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., OTTOBRUNN [WEST GERMANY].
Development of a prototype 10kW solar power plant
[BMFT-FB-T-78-33] N79-32730
MIAMI UNIV., OXFORD, OHIO.
Nuclear-pumped lasers 2
[NASA-CR-162320] N79-32539
MICHIGAN TECHNOLOGICAL UNIV., HOUGHTON.
Fracture toughness of Widmanstatten colonies of an alpha-beta titanium alloy
[AD-A070745] N79-32331
Machining powder metallurgy materials
[AD-A070913] N79-32336
Fracture along planar slip bands
[AD-A070788] N79-32585
MICHIGAN UNIV., ANN ARBOR.
Extraterrestrial fiberglass production using solar energy
N79-32237
The performance of a vectorized 3-D Navier-Stokes code on the CRAY-2 computer
[AD-A071137] N79-32510
Phased models for evaluating the performability of computing systems
[NASA-CR-162317] N79-32876
METAPHOR [version 1]: Users guide
[NASA-CR-162322] N79-32877
Performability modeling with continuous accomplishment sets
[NASA-CR-162323] N79-32906
MICROWAVE ASSOCIATES, INC., BURLINGTON, MASS.
High microwave frequency passive components
[AD-A070348] N79-32469
MIDWEST RESEARCH INST., GOLDEN, COLO.
Review of current research on hydrocarbon production by plants
[SERI/TR-33-129] N79-32374
Solar thermal test facilities users association
[SERI/PR-13-154] N79-32688
Solar Repowering Workshop
[SERI/TP-35-57] N79-32689
MINNESOTA UNIV., MINNEAPOLIS.
A study of flicker noise in MOSFETS
[AD-A070313] N79-33080
MISSISSIPPI STATE UNIV., MISSISSIPPI STATE.
A study of the EMP interaction with aircraft over an imperfect ground plane
[AD-A070388] N79-32420
MISSOURI UNIV. - COLUMBIA.
Mechanisms of oxygen toxicity at the cellular level
[AD-A070026] N79-32823
MITEC G.M.B.H., OTTOBRUNN [WEST GERMANY].
The use of the heat pumps to raise temperatures in an economical and ecological way
[BMFT-FB-T-78-35] N79-32732
MITRE CORP., BEDFORD, MASS.
Fiber optics for tactical communications
[AD-A070274] N79-33015
MITRE CORP., MCLEAN, VA.
Telehealth handbook: A guide to telecommunications technology for rural health care
[MTR-7581] N79-32413
Biomedical communications experiments using the communications technology satellite: Executive summary
[PB-294405/6] N79-32459
MOUND LAB., MIAMISBURG, OHIO.
Evaluation of a large nonconvective solar pond
[MLM-2606[OP]] N79-32680

N

NAGOYA UNIV. [JAPAN].
Preliminary experiment of neutral beam injection heating in JIPP T-2 device
[IPPJ-392] N79-33027
Numerical calculations on the propagation of microwaves in highly over-dense magnetized plasma
[IPPJ-404] N79-33028
Cross-field electron heat transport due to high frequency electrostatic waves
[IPPJ-405] N79-33029
Competition of weakly collisional and neighboring wave effects for the destruction of amplitude oscillations
[IPPJ-407] N79-33030
An ion source plasma starting from a cold LaB6 cathode 1
[IPPJ-406] N79-33031
Compression of toroidal plasma by imploding plasma-liner
[IPPJ-408] N79-33032
Initial frequency shift of large amplitude plasma wave. 2: Ion acoustic wave
[IPPJ-409] N79-33033
Single electron capture into AR[+] excited states in Ar2 [+] Na collision below 12 keV. 1: Absolute measurement of emission cross-section
[IPPJ-410] N79-33034
NATIONAL AERONAUTICAL ESTABLISHMENT, OTTAWA [ONTARIO].
Powered-lift aircraft handling qualities in the presence of naturally-occurring and computer-generated atmospheric disturbances
[AD-A072118] N79-32198
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C.
Aeronautical Engineering. A continuing bibliography, supplement 112
[NASA-SP-7037[112]] N79-32150
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
Large eddy simulation of turbulent channel flow: ILLIAC 4 calculation
[NASA-TM-78619] N79-32152
Cockpit displays of traffic information: Airline pilots opinions about content, symbology, and format
[NASA-TM-78601] N79-32185
Low-cost inertial navigation for moderate-g missions
[NASA-TM-78611] N79-32205
Space resources and space settlements
[NASA-SP-428] N79-32225
Research planning criteria for regenerative life-support systems applicable to space habitats
N79-32227
Mining and beneficiation of lunar ores
N79-32241
Release-rate calorimetry of multilayered materials for aircraft seats
[NASA-TM-78594] N79-32265
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. HUGH L. DRYDEN FLIGHT RESEARCH CENTER, EDWARDS, CALIF.
Effect of element density on the NASTRAN calculated mechanical and thermal stresses of a spar
[NASA-TM-72868] N79-32151
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.
Safety shield for vacuum/pressure chamber viewing port
[NASA-CASE-GSC-12513-1] N79-32217
High speed, glitch-free digital to analog converter
[NASA-CASE-GSC-12319-1] N79-32852
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.
A geologic assessment of potential lunar ores
N79-32239
Extraction processes for the production of aluminum, titanium, iron, magnesium, and oxygen and nonterrestrial sources
N79-32240
Large Area Crop Inventory Experiment [LACIE]. Sampling unit size considerations in large area crop inventorying using satellite-based data
[E79-10283] N79-32608
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, HAMPTON, VA.
Effect of outboard vertical-fin position and orientation on the low-speed aerodynamic performance of highly swept wings
[NASA-TM-80142] N79-32158
Review of design and operational characteristics of the 0.3-meter transonic cryogenic tunnel
[NASA-TM-80123] N79-32159
Elevated-temperature application of the IITRI compression test fixture for graphite/polyimide filamentary composites
[NASA-TP-1496] N79-32277
Effect of 25 cycles of launch pad exposure and simulated mission heating on space shuttle reusable surface insulation coated with reaction cured glass
[NASA-TM-80160] N79-32358
On the minimization of spherical aberration in spherical reflector antennas
[NASA-TM-80140] N79-32466
Longitudinal vortices in a transitioning boundary layer
[NASA-TM-80161] N79-32498
Velocity field of a round jet in a cross flow for various jet injection angles and velocity ratios
[NASA-TP-1506] N79-32500
Comparison of alternate fuels for aircraft
[NASA-TM-80155] N79-32637
Langley program of GaAs solar cells
N79-32644
Radiation damage in GaAs solar cells
N79-32663
Laboratory study of annoyance to combined airplane and road-traffic noise
[NASA-TP-1478] N79-32743
A summation and inhibition model of annoyance response to multiple community noise sources
[NASA-TP-1479] N79-32744
Earth Radiation Budget Science, 1978
[NASA-CP-2100] N79-32797
Earth Radiation Budget Science, 1978. 1: Introduction
N79-32798
Climate modeling
N79-32799
Climate diagnostics
N79-32800
Radiation modeling
N79-32801
Radiation variability and correlation studies
N79-32802
Cloudiness and the radiation budget
N79-32803
Radiation budget and related measurements in 1985 and beyond
N79-32804
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.
Mass drivers. 3: Engineering
N79-32232
Evaluation and auger analysis of a zinc-dialkyldithiophosphate antiwear additive in several diester lubricants
[NASA-TP-1544] N79-32359
Multistage depressed collector for dual mode operation
[NASA-CASE-LEW-13282-1] N79-32463
Optically isolated logarithmic nanoammeter capable of floating to 5 kilovolts
[NASA-TP-1527] N79-32467
Comparison of predicted and measured elastohydrodynamic film thickness in a 20-millimeter-bore ball bearing
[NASA-TP-1542] N79-32552
Solar Cell High Efficiency and Radiation Damage, 1979
[NASA-CP-2097] N79-32640
The NASA Lewis Research Center program in space solar cell research and technology
N79-32641
Open-circuit voltage improvements in low-resistivity solar cells
N79-32649
Modeling of thin, back-wall silicon solar cells
N79-32650
Radiation damage in high-voltage silicon solar cells
N79-32658
Reverse annealing in radiation-damaged, silicon solar cells
N79-32660
Temperature and intensity dependence of the performance of an electron-irradiated [AlGa]As/GaAs solar cell
N79-32665
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.
A fast routine for computing
[NASA-TM-78133] N79-32612
The wave structures of the Eady model of baroclinic instability
[NASA-TP-1548] N79-32796
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. PASADENA OFFICE, CALIF.
Baseband signal combiner for antenna array
[NASA-CASE-NPO-14641-1] N79-32408
NATIONAL AEROSPACE LAB., AMSTERDAM [NETHERLANDS].
Windtunnel measurements on the interference between a jet and a wing located outside the jet. Part 1: Text, tables, and figures
[NLR-TR-77009-U] N79-32175
Calculation of the flow around a swept wing, taking into account the effect of the three-dimensional boundary layer. Part 2: Wing with laminar boundary layer on the lower surface
[NLR-TR-77066-U] N79-32176
Experimental investigation of the aerodynamic characteristics of a wing in a jet flow
[NLR-TR-77081-U] N79-32177
The design and aerodynamic characteristics of an 18% thick shock-free airfoil [NLR 7501]
[NLR-MP-78016-U] N79-32180
Multi-element airfoil design by optimization
[NLR-TR-78135-U] N79-32181
Comparison of some methods to determine the delays of landing aircraft with respect to runway capacity
[NLR-MP-77028-U] N79-32191
Wind shear during approach: An investigation into the influence of a tower measured wind environment

on the symmetric motions of a simulated aircraft during an automatic approach
[NLR-TR-77078-U] N79-32192
Navaid calibration evaluation with a computer controlled avionics data acquisition system
[NLR-MP-78030-U] N79-32193
Qualification tests for helicopters to be used on board ships
[NLR-MP-78032-U] N79-32204
Handling problems resulting from compressor deterioration
[NLR-MP-78019-U] N79-32214
Aircraft design loads due to non-stationary atmospheric turbulence patches
[NLR-TR-78073-U] N79-32216
Military satellite communications, history and status as of 1974
[NRL-TR-74173-U] N79-32254
Some investigations on the notching procedure used in shaker tests on satellites
[NLR-TR-76134-U] N79-32255
Multiple attitude maneuvers for a spinning spacecraft disturbed by solar radiation
[NLR-TR-78078-U] N79-32260
Survey of modern control and observation theory for disturbed, target following aerospace systems. Part 2: Stochastic performance and spacecraft application
[NLR-TR-78062-U-PT-2] N79-32261
Scanning electron microscopy of fracture surfaces of carbon composite materials
[NLR-TR-76035-U] N79-32280
Residual strength properties of carbon/epoxy composite materials
[NLR-TR-77039-U] N79-32281
Environmental fatigue crack propagation in metal/composite laminates
[NLR-MP-78027-U] N79-32283
Determination of the thermal conductivity of carbon fiber reinforced plastic sheet material
[NLR-TR-77113-U] N79-32284
Thermal conductance measurement of honeycomb sandwich panels with carbon fiber reinforced plastic face sheets
[NLR-TR-78081-U] N79-32285
Residual strength of [0, + or - 45] sub s and [+ or - 45, 0] sub s carbon/epoxy laminates
[NLR-TR-77115-U] N79-32287
Environmental fatigue crack propagation in metal/composite laminates
[NLR-TR-77122-U] N79-32288
Residual strength of Kevlar-carbon/epoxy hybrid composite materials
[NLR-TR-78008-U] N79-32289
Residual strength characteristics of composite reinforced stiffened panels
[NLR-TR-78025-U] N79-32290
Investigation of the length dependency of carbon fibers and the related unidirectional composite strength
[NLR-TR-78050-U] N79-32291
Aluminum alloys for advanced structural applications in transport aircraft
[NLR-MP-77023-U] N79-32344
The effect of sheet thickness on flight simulation fatigue crack propagation in 2024-T3, 7475-T761, and mill annealed Ti-6Al-4V
[NLR-MP-77024-U] N79-32345
Quantitative models of hydrogen induced cracking in high strength steel
[NLR-MP-78018-U] N79-32346
Quantitative models of hydrogen embrittlement in high strength steel
[NLR-MP-78024-U] N79-32347
Effect of an anti-corrosion penetrant on the fatigue life of various riveted joints during flight simulation tests
[NLR-TR-77103-U] N79-32350
Heat treatment studies of aluminum alloy type 7050 forgings. Corroded-specimen fatigue tests and SSC propagation tests
[NLR-TR-77124-U] N79-32351
European Research Program on Viscous Flows [EUROVISC]
[NLR-MP-78033-U] N79-32519
Heat balance research with a thin-walled cube in a simulated space environment
[NLR-TR-78060-U] N79-32522
A finite element model to study the buckling behavior of general orthotropic, midplane symmetric, elastic plates
[NLR-TR-77062-U] N79-32594
Fracture mechanics and ambient temperature sustained load fracture
[NLR-MP-78008-U] N79-32595
Engineering application of fracture mechanics to flight simulation
[NLR-MP-78015-U] N79-32596
Gust spectrum fatigue crack propagation in candidate skin materials
[NLR-MP-78022-U] N79-32597
Electronic processing of infrared scanner signals using CCD memory techniques
[NLR-MP-78031-U] N79-32623
Investigations on the aeroelastic stability of large wind turbines
[NPL-MP-78014-U] N79-32731
Performance and workload analysis of inflight helicopter missions
[NLR-MP-77013-U] N79-32834
A theoretical and experimental analysis of the outside world perception process
[NLR-MP-78020-U] N79-32835
Microprocessor as an intelligent interface between flight data acquisition equipment and a minicomputer
[NLR-MP-78007-U] N79-32861
On the use of spline functions and collocation in a trajectory optimization algorithm based on mathematical programming
[NLR-TR-78016-U] N79-32926

NATIONAL AVIATION FACILITIES EXPERIMENTAL CENTER, ATLANTIC CITY, N. J.
Interim results of DABS/ATCRBS electromagnetic compatibility testing
[AD-A072087] N79-32418

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C.
Photoemission studies of H2S, H2, and S adsorbed on Ru[110]: Evidence for an adsorbed SH species
[AD-A070054] N79-32307
Plasma poling of poly [vinylidene fluoride]: Piezoand pyroelectric response
[AD-A070750] N79-32361
Ferroelectric polarization in polymers
[AD-A070768] N79-32362
Standard procedure for use of thermoluminescence dosimetry in radiation-hardness testing of electronic devices
[AD-A071172] N79-32474
Piezo and pyroelectric properties of electrets
[AD-A070808] N79-32475
HUD utilities demonstration series. Volume 9: Description of the data acquisition and instrumentation systems, Jersey City total energy project
[PB-294926/1] N79-32738
Fabrication of piezoelectric polymer film
[AD-A070822] N79-33090

NATIONAL ENVIRONMENTAL SATELLITE SERVICE, WASHINGTON, D. C.
Selected hydrologic applications of LANDSAT-2 data: An evaluation
[E79-10264] N79-32603

NATIONAL GEODETIC SURVEY, ROCKVILLE, MD.
Geodetic bench marks
[PB-296427/8] N79-32792

NATIONAL GEOPHYSICAL AND SOLAR-TERRESTRIAL DATA CENTER, BOULDER, COLO.
Solar-geophysical data number 415, March 1979. Part 1: Prompt reports, data for February 1979, January 1979
[PB-296275/1] N79-33146

NATIONAL HURRICANE CENTER, CORAL GABLES, FLA.
Modification of NMC analyses and prognoses for use in statistical tropical cyclone prediction models
[PB-297190/1] N79-32814

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO.
Uncertainties in adaptive maximum entropy frequency estimators
[PB-296131/6] N79-32489
A catalog of low-frequency oscillations of the earth's magnetic field as observed as SMS-2 and GOES-2 during December 1977
[PB-294327/2] N79-32793

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, MIAMI, FLA.
Record keeping on aircraft instruments
[PB-295698/5] N79-32208

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, SEATTLE, WASH.
Winter circulation and hydrography over the continental shelf of the north gulf of Alaska
[PB-296914/5] N79-32821

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, D. C.
Report to the Congress on ocean dumping research. Public law 92-532, title 2, section 201
[NOAA-S/T-77-2838] N79-32741
Cost-benefit analysis of selected environmental and data information service programs
[PB-297189/3] N79-32753

NATIONAL PHYSICAL LAB., TEDDINGTON [ENGLAND].
Correlation and estimation of vapor-liquid critical properties. Part 2: Critical pressures and critical volumes of organic compounds
[NPL-CHEM-98] N79-32316
Torsion tests on steels used in the manufacture of high pressure vessels
[NPL-CHEM-97] N79-32349
The ampere, the kilogram, and the fundamental constants. Is there a weighing problem?
[NPL-QU-52] N79-32399
Activities of the Division of Quantum Metrology
[NPL-QU-AR-77] N79-32400
Activities of the Division of Quantum Metrology
[NPL-QU-AR-78] N79-32401
The conclave computer teleconferencing system
[NPL-COM-107] N79-32446
A damped flat-plate coupler for use in calibrating circumaural earphones
[NPL-AC-90] N79-32452
A review of the fundamental methods used for measuring gage pressures up to kPa
[NPL-MOM-34] N79-32533
A new method for the measurement of Rockwell diamond indenters
[NPL-MOM-33] N79-32557
Spectral lineshape calculation for a stratospheric emission model
[NPL-QU-50] N79-32780
Some further developments of the iterative digital cellular multiplier
[NPL-DES-51] N79-32860
The NPL implementation of level 2 of the X25 interface
[NPL-DNACS-18/79] N79-32862
A brief guide to NPL Algorithms Library, 1979
[NPL-CSU-3/79] N79-32884
Definition and verification of computer network protocols
[NPL-DNACS-15/79] N79-32885
Some linear differential equation problems in the analysis of dissolved species in cracks
[NPL-DNACS-14/79] N79-32927
The AQ algorithm for the solution of a sparse system of linear equations
[NPL-DNACS-17/79] N79-32928
Diagnosis of the jet plasma using electron cyclotron emission
[NPL-DES-53] N79-33062

NATIONAL SWEDISH ROAD AND TRAFFIC RESEARCH INST., LINKOEPING.
Chemical de-icing of roads: The effect on road accidents
[VTI-145] N79-33106

NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA.
Boron reinforced composites, volume 2. A bibliography with abstracts
[NTIS/PS-79/0476/6] N79-32292
Microwave communication, volume 2. A bibliography with abstracts
[NTIS/PS-79/0525/0] N79-32454
Radiation damage of laser materials. A bibliography with abstracts
[NTIS/PS-79/0514/4] N79-32547
Hypothermia. A bibliography with abstracts
[NTIS/PS-79/0533/4] N79-32830

NATIONAL TELECOMMUNICATION INFORMATION ADMINISTRATION, BOULDER, COLO.
Estimates of maximum electric field strengths in the automobile environment
[PB-294819/8] N79-32453

NATIONAL WEATHER SERVICE, SILVER SPRING, MD.
Aviation automated weather observation system [AV-AWOS]
[AD-A072119] N79-32805
Interduration precipitation relations for storms: Southeast states
[PB-297192/7] N79-32815

NAVAL AEROSPACE MEDICAL RESEARCH LAB., PENSACOLA, FLA.
Human performance in time-shared verbal and tracking tasks
[AD-A070275] N79-32831

NAVAL AIR TEST CENTER, PATUXENT RIVER, MD.
Multidimensional quadrature formulas using partial derivates
[AD-A070582] N79-32915

NAVAL CIVIL ENGINEERING LAB., PORT HUENEME, CALIF.
Recycling of asphalt concrete airfield pavement: A laboratory study
[AD-A072117] N79-32218
Development of supercorroding alloys for use as timed releases for ocean engineering applications
[AD-A070860] N79-32334

NAVAL INTELLIGENCE PROCESSING SYSTEM SUPPORT ACTIVITY, ALEXANDRIA, VA.
Structured programming in a database environment
[AD-A070270] N79-32881

NAVAL OCEAN SYSTEMS CENTER, SAN DIEGO, CALIF.
Computer display set AN/UYQ-21 TECHEVAL test. System meets all specifications and is judged to be suitable for OPEVAL
[AD-A070260] N79-32857

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
Computer networks
[AD-A070223] N79-32423
Design study of a low profile, high frequency antenna system
[AD-A070091] N79-32436
The radio spectrum international allocation and regulation
[AD-A070110] N79-32437

Use of Galerkin methods in numerical weather prediction
[AD-A070458] N79-32807
Statistical adjustment of dynamical tropical cyclone model track predictions
[AD-A070094] N79-32810
Heavy traffic results for single server queues with dependent EARMA service and interarrival times
[AD-A070086] N79-32895
An efficient method for solving stiff transient field problems arising from FEM formulations
[AD-A070085] N79-32914
Inelastic electron scattering from Li-7 in the vicinity of the alpha-triton threshold
[AD-A071072] N79-32983

NAVAL RESEARCH LAB., WASHINGTON, D. C.

ADINC: An implicit Lagrangian hydrodynamics code
[AD-A070361] N79-32503
Linear stability of self-similar flow: 5. Convective instability in bounded uniform self-gravitating spheres
[AD-A070709] N79-32508
An interim report on the NTS-2 solar cell experiment
N79-32656
A filled silicone rubber materials system with selectable acoustic properties for molding and coating applications at ultrasonic frequencies
[AD-A070461] N79-32972
Brillouin backscatter dependence upon pulse amplitudes, timing, target material and geometry
[AD-A070300] N79-33037
Generation of a rotating liquid liner by tangential injection
[AD-A070890] N79-33038
Direct solution of the equation of transfer using frequency and angle-averaged photon escape probabilities
[AD-A070545] N79-33045
Optimization of stabilized imploding liner fusion reactors
[AD-A070889] N79-33046
Long-pulse laser-plasma interactions at 10 to the 12th power-10 to the 15th power W/cm squared
[AD-A070462] N79-33047
An MHD instability primer
[AD-A071099] N79-33048

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, ANNAPOLIS, MD.

Galvanic corrosion of piping and fitting alloys in sulfide-modified seawater
[AD-A070677] N79-32333

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.

Fatigue failure prediction by X-ray double crystal diffractometry
[AD-A070296] N79-32327

NAVAL SURFACE WEAPONS CENTER, DAHLGREN, VA.

Eddy current testing and ultrasonic reference standards for depleted uranium barstock
[AD-A070295] N79-32971

NAVAL SURFACE WEAPONS CENTER, WHITE OAK, MD.

Deflagration to detonation transition behavior of aluminized HMX
[AD-A070645] N79-32371
Development of random choice numerical methods for blast wave problems
[AD-A071156] N79-32439
Temperature profile in Li/So2 cells during discharge
[AD-A070378] N79-32676

NAVAL WEAPONS CENTER, CHINA LAKE, CALIF.

Wavelength repeatability of a Cary model 14 R spectrophotometer
[AD-A070704] N79-32528

NEBRASKA UNIV. - LINCOLN.

Torsion theories with the bounded splitting property
N79-32963

NEBRASKA UNIV., LINCOLN.

Electrical properties of thin GaAs films deposited by sputtering
[AD-A070017] N79-33081

NEW JERSEY INST. OF TECHNOLOGY, NEWARK.

Inplane and out of plane buckling of thick rings subjected to hydrostatic pressure
N79-32573

NEW MEXICO ENERGY INST., ALBUQUERQUE.

Theoretical analysis of a passive heat pipe heating and cool system
[PB-296066/4] N79-32736

NEW YORK UNIV., N. Y.

An anti-Mach metric in the Jordan-Brans-Dicke theory of gravitation
N79-32760
Automatic storage optimization
N79-32848
Groups with solvable word problems
N79-32868
An analysis approach to diffusion approximations in queueing
N79-32892
Qualitative analysis of the periodically forced relaxation oscillations
N79-32965
A model for diffuse interstellar clouds: Improvements to the theory of molecular hydrogen photodestruction and to the gas phase chemistry of carbon monoxide
N79-33130

NORTH CAROLINA STATE UNIV. AT RALEIGH.

Thermal stability of natural convection in slots and flow down an inclined heated plane
N79-32497
D region amplitude distribution, cone angle of arrival, and electron density profiles
[AD-A070358] N79-32771

NORTH CAROLINA UNIV., CHAPEL HILL.

Queues and stores with nonhomogeneous input
[AD-A069550] N79-32900

NORTH TEXAS STATE UNIV., DENTON.

The evaluation and control of the changes in basic statistics encountered in grouped data
N79-32943

NORTHROP RESEARCH AND TECHNOLOGY CENTER, PALOS VERDES PENINSULA, CALIF.

Plasma sheath processes
[AD-A070819] N79-33044

NORTHWESTERN UNIV., EVANSTON, ILL..

Residual stresses in ground steels
[AD-A070798] N79-32584

NOTRE DAME UNIV., IND.

Feasibility study of liquid pool burning in reduced gravity
[NASA-CR-159642] N79-32303
Dynamic analysis of cylindrical shells with cutouts and cracks
N79-32572
Symmetry breaking in nuclei
N79-32993
Allowed and forbidden transitions in metallic ferromagnetics and ferrimagnets
N79-33067
An investigation of factors affecting the semiconductor-to-metal transition of V[1-x]W[x]O[2]
N79-33076

O

OAK RIDGE GASEOUS DIFFUSION PLANT, TENN.

Optimum axial flow taper in a countercurrent gas centrifuge
[K/OA-4445] N79-32504

OAK RIDGE NATIONAL LAB., TENN.

Recent developments in coal liquefaction in the United States
[CONF-790213-5] N79-32383
Condensation of refrigerants on vertical fluted tubes
[ORNL/TM-5848] N79-32515
PCM techniques aid in storing analog data: An exact magnetic-tape storage method for analog measurement signals
[ORNL/TR-4573] N79-32529
Frequency analysis of a thick-rim flywheel
[ORNL/TM-5804] N79-32555
Stress analysis of cylindrical pressure vessels with closely spaced nozzles by the finite-element method. Volume 2: Vessels with two nozzles under external force and moment loadings
[NUREG-CR-0132] N79-32590
Structural model testing for prestressed concrete pressure vessels: A study of grouted vs nongrouted posttensioned prestressing tendon systems
[ORNL/TM-6478] N79-32592
Laser Techniques in Photovoltaic Research
N79-32655
Decentralized solar energy technology assessment program: Research plan
[ORNL/TM-6913] N79-32677
Wind turbines
[ANL/CES/TE-78-9] N79-32711
Proposed industrial energy data base for technical evaluation of alternative energy systems
[CONF-781244-1] N79-32725
Overview of waste heat utilization techniques
[CONF-790443-2] N79-32726
Meteorological Effects of Thermal Energy Releases [METER] program
[ORNL/TM-6248] N79-32812
Electron-cyclotron heating of toroidal plasma with emphasis on results from the ELMO Bumpy Torus [EBT]
[ORNL/TM-6703] N79-33052
Effects of hot electrons on magnetohydrodynamic modes in EBT
[ORNL/TM-6824] N79-33054
New materials properties achievable by ion implantation doping and laser processing
[CONF-781121-22] N79-33093
User's guide to program MAD: A computer program for the organization and manipulation of magnetic tape directories
[ORNL/TM-6597] N79-33102

OESTERREICHISCHE AKADEMIE DER WISSENSCHAFTEN, VIENNA.

Space activity in Austria, 1978/79
N79-32249

OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS [FRANCE].

Construction problems for high Reynolds number wind tunnel models
[ONERA-NT-1978-6] N79-32224
Early formation of nitrogen oxides during combustion of hydrocarbons
[ONERA-NT-1978-4] N79-32314
Influence of turbulence on hydrocarbon combustion in a stirred combustor
[ONERA-NT-1978-7] N79-32315
PROCOPES [Conversational Program for Signal Processing]: Evolution toward an interpretative command language
[ONERA-NT-1978-8] N79-32883
Synchronization of clocks in the 100 ps range
[ONERA-NT-1978-1] N79-32968

OFFICE OF RADIATION PROGRAMS, WASHINGTON, D. C.

A survey of the available methods of solidification for radioactive wastes
[PB-295214/1] N79-33010

OFFICE OF TECHNOLOGY ASSESSMENT, WASHINGTON, D. C.

Renewable ocean energy sources. Part 2: Working papers: ocean winds, currents, waves, tides and salinity gradients
[PB-295876/7] N79-32735

OFFICE OF THE ASSISTANT SECRETARY FOR POLICY, PLANS AND INTERNATIONAL AFFAIRS [DOT], WASHINGTON, D. C.

Trends in the air service provided by certificated carriers: 1938-1977
[PB-295190/3] N79-32184

OHIO STATE UNIV., COLUMBUS.

Communication application of adaptive arrays
[AD-A070181] N79-32431
Studies in gravimetric geodesy
[AD-A064741] N79-32768
A global 1 deg. x 1 deg. anomaly field combining satellite, GEOS-3 altimeter and terrestrial anomaly data
[AD-A064740] N79-32769
Estimation of rate constants in the Michaelis-Menten model
[AD-A070360] N79-32824
Identification of finite state models of human operators
[AD-A070079] N79-32897

OHIO STATE UNIV. RESEARCH FOUNDATION, COLUMBUS.

Kinetics of the displacement reaction between Fe and Cu2O at temperatures between 800 and 1050 degrees C
[AD-A070664] N79-32308

OKLAHOMA UNIV., NORMAN.

Mathematical modeling and micromechanics of fiber-reinforced bimodulus composite materials
[AD-A071389] N79-32278

OLD DOMINION UNIV. RESEARCH FOUNDATION, NORFOLK, VA.

Photoelastic studies of advanced lap joint concept
[NASA-CR-162316] N79-32575

OPTICAL COATING LAB., INC., CITY OF INDUSTRY, CALIF.

Silicon solar cells for space use: Present performance and trends
N79-32654

OPTICAL DESIGN SERVICE, TUCSON, ARIZ.

Development of techniques for the design of athermalized optical systems
[AD-A070257] N79-33016

ORINCON CORP., LA JOLLA, CALIF.

Practical control algorithms for nonlinear stochastic systems and investigations of nonlinear filters
[AD-A069980] N79-32953

OWENS-ILLINOIS, INC., TOLEDO, OHIO.

Investigation of broad-band emitters as potential lasing ions between 0.5 and 1.0 micrometers
[AD-A070971] N79-32543

OXFORD UNIV. [ENGLAND].

Effect of deep wedge-shaped notches of small flank angle on plastic failure
[OUEL-1282/79] N79-32598
River quality models near outfalls
[OUEL-1270/78] N79-32752

P

PACIFIC ENVIRONMENTAL SERVICES, INC., SANTA MONICA, CALIF.

VOC [Volatile Organic Compounds] emissions reduction study for oxidant attainment in Massachusetts, Rhode Island, and Connecticut
[PB-294983/2] N79-32754
Summary of group I control technique guideline documents for control of volatile organic emissions from existing stationary sources
[PB-294975/8] N79-32755

PARSONS [RALPH M.] CO., PASADENA, CALIF.

Prestressed concrete pressure vessels: Conceptual design/economic, executive summary
[FE-1775-19] N79-32591

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Determination of surface characteristics and energy budget over an urban-rural area using satellite data and a boundary layer model
[E79-10269] N79-32604
PENNSYLVANIA UNIV., PHILADELPHIA.
Combustion of uniformly sized droplet sprays in a refractory tube
N79-32299
The effects of composition and carbide precipitation of temper embrittlement of 2 1/4 Cr-1 Mo steels
N79-32322
Laminar condensation phenomenon associated with a moving droplet
N79-32495
Theoretical and computational aspects of reliability indices for large scale systems
N79-32558
Static and dynamic finite deformations of viscoelastic solids and structures
N79-32567
Contact stresses on bodies with arbitrary geometry
N79-32569
Updating the limit efficiency of silicon solar cells
N79-32645
Isothermal flow distribution in solar collectors and collector manifolds
[ALO-5319-1] N79-32708
Oxygen delivery in the hypoxic perfused heart: Relation to functional and metabolic changes
N79-32825
Cooperative responses from a portable natural language data base query system
N79-32867
Dynamic multilevel simulation
N79-32872
Modular calorimeter system for use in high energy physics
[COO-3071-239] N79-32994
Stark modulation spectroscopy of molecular crystals
N79-33066
Statistical thermodynamics of sorption in molecular sieves
N79-33095
PITTSBURGH UNIV., PA.
Computer modeling of film growth and resistance estimation of semi-continuous metal films
N79-32317
Molecular structure and cohesive properties of polymeric adhesives
[AD-A069517] N79-32365
Screening of zeolite catalysts for methanol conversion to light hydrocarbons
[COO-4691-1] N79-32386
An automated thesaurus construction based on a distance measurement between keywords
N79-33100
An analysis of the effects of optical aberrations on relative positions of stars in the image plane of astrometric telescopes
N79-33116
PLANNING RESEARCH CORP., MCLEAN, VA.
Application and system design study for cost-effective solar photovoltaic systems at Federal installations
[HCP/M2522-01] N79-32715
PLESSEY CO. LTD., TOWCESTER (ENGLAND).
Millimeter wave low noise front end
[CD.6500636] N79-32487
POLYTECHNIC INST. OF NEW YORK.
Low cycle fatigue behavior of Ti-Mn alloys
N79-32321
A study of wire coating extrusion
N79-32396
Guided wave propagation in bounded inhomogeneous media
N79-32405
The mass and heat transfer in laminar pulsatile flow
N79-32492
Two-photon correlations in amplified laser light
N79-32537
The automatic revision of storage structures
N79-32844
Oscillation theory of systems of ordinary differential equations
N79-32901
POLYTECHNIC INST. OF NEW YORK, BROOKLYN.
Assessment of hydropower restoration and expansion in New York State, volume I
[PB-295782/7] N79-32734
Analysis and design of pipelined processors
N79-32846
Some nonlinear problems in transonic helicopter acoustics
[AD-A069564] N79-32974
POLYTECHNIC INST. OF NEW YORK, FARMINGDALE.
Robust optimal systems in radar and communications
N79-32406
A contribution to diffusion theory with applications
N79-32893
Robust detectors based on the occupancy vector
N79-32905
Studies on the interactions between electromagnetic fields and plasmas
[AD-A071017] N79-33043
PRATT AND WHITNEY AIRCRAFT, WEST PALM BEACH, FLA.
Survivability of silicon nitride bearing
[AD-A070383] N79-32553
PRATT AND WHITNEY AIRCRAFT GROUP, EAST HARTFORD, CONN.
Lean, premixed, prevaporized fuel combustor conceptual design study
[NASA-CR-159647] N79-32211
PRATT AND WHITNEY AIRCRAFT GROUP, WEST PALM BEACH, FLA.
Low cycle fatigue properties of MAR-M-246 Hf in hydrogen
[NASA-CR-161296] N79-32324
Development of sputtered techniques for thrust chambers
[NASA-CR-159637] N79-32326
PRC ENERGY ANALYSIS CO., MCLEAN, VA.
Economic and demographic issues related to deployment of the Satellite Power System [SPS]
[NASA-CR-158886] N79-32699
PREUSSAG A.G., ERDOEL UND ERDGAS, HANNOVER (WEST GERMANY).
Improvement of the MVD method [Migration Velocity Determination]
[BMFT-FB-T-78-30] N79-32779
PRINCETON UNIV., N. J.
Retrieval of asteroidal materials
N79-32234
Research on unsteady combustion processes
[AD-A069545] N79-32262
On the electrically stimulated filtration of aerosols
N79-32300
Evaluation of candidate metals in a simulated space shuttle main engine environment for application as turbine blade dampers
[NASA-CR-161299] N79-32325
Formation and properties of rubber-modified epoxies
N79-32357
Optical versus transport processes in chalcogenide glasses
[AD-A070927] N79-32360
The application of difference methods in fluid mechanics
[AD-A069544] N79-32511
Simulation of high dimensional systems
N79-32958
A self-avoiding random walk
N79-32962
The von Weizsaecker and exchange corrections in the Thomas Fermi theory
N79-32981
Numerical integration of the orbit-averaged Fokker-Planck equation: The evolution of Plummer's model
N79-33117
On the description and development of large clusters of galaxies through the cluster-galaxy correlations
N79-33127
PURDUE UNIV., LAFAYETTE, IND.
Thermorheological effects on fatigue life of fiber composites
N79-32272
Computerized pattern recognition applied to Ni-Cd cell lifetime prediction
[AD-A070344] N79-32675

R

R AND D ASSOCIATES, MARINA DEL REY, CALIF.
Inverse bremsstrahlling absorption rate in an intense laser field
[UCRL-13965] N79-32544
RAYTHEON CO., BURLINGTON, MASS.
Transportation systems center bibliography of technical reports
[PB-296342/9] N79-33107
RCA ADVANCED TECHNOLOGY LABS., CAMDEN, N. J.
Expansion of CMOS array design techniques
[NASA-CR-150318] N79-32628
RCA GOVERNMENT COMMUNICATIONS SYSTEMS, CAMDEN, N. J.
Silicon-gate CMOS/SOS processing
[NASA-CR-150319] N79-32464
Device model for FETSIM circuit simulation program
[NASA-CR-150321] N79-32465
RCA LABS., PRINCETON, N. J.
Epitaxial growth of semi-insulating GaAs
[AD-A071166] N79-33089
RESEARCH CORP. OF NEW ENGLAND, WETHERSFIELD, CONN.
Assessment of surface runoff from iron and steel mills
[PB-294981/6] N79-32756
RESEARCH INST. OF NATIONAL DEFENCE, STOCKHOLM (SWEDEN).
Nondestructive measurement of fiber direction and fiber amount in carbon fiber reinforced laminates
[FOA-C-20306-F9] N79-32286
Swedish earthquakes and acceleration probabilities
[FOA-C-20295-E4] N79-32782
Shalit Perceptual Organization and Reduction Questionnaire [SPORQ]. Report 2: Characteristics and reliability
[FOA-C-55031-H6] N79-32836
Calculation of forward scattered intensity from particles at optical beam propagation
[FOA-C-30164-E1] N79-33026
Magnetized whirls in plasma discharges
[FOA-C-20303-D9] N79-33063
RESEARCH TRIANGLE INST., RESEARCH TRIANGLE PARK, N. C.
Computer modeling of a two-junction, monolithic cascade solar cell
N79-32672
RHEINISCHE BRAUNKOHLENWERKE A.G., COLOGNE (WEST GERMANY).
Research and development work for hydrogasification of coal with nuclear processing heat done in the framework of the prototype nuclear processing heater project
[BMFT-FB-T-78-25] N79-32393
RHODE ISLAND UNIV., KINGSTON.
An investigation of low Reynolds number free vertical jet flows
N79-32155
Hydrogen permeation in iron at low temperatures
[AD-A070309] N79-32328
RICE UNIV., HOUSTON, TEX.
Semiconducting properties of passive films on tin in slightly alkaline solutions
N79-32294
Study of volume phase hologram recording in Fe:LiNbO3 using optical pulses, part 1. Investigation of absorption and gain of laser dyes with picosecond pumping, part 2
N79-32536
Rocket-based measurement of Birkeland currents in an active post-midnight aurora
N79-32762
Dynamic reassignment in distributed processing systems
N79-32888
Shock tube studies of reaction and energy transfer rates between molecules and reactive atoms
N79-32980
The formation of reactive intermediates in rare-gas matrices and a study of the interactions involved in proton rare-gas clusters
N79-32982
Ultrasonic generation in thin films of TbFe2
N79-33073
Correlation between the kinetic and thermodynamic properties of interstitial solid solutions
N79-33077
The role of structure in determining the thermodynamic properties of homogeneous fluid mixtures
N79-33094
Models of the distribution of photometric properties of galaxies with star formation
N79-33118
Nucleosynthesis in supernovae and the origin of isotopic heterogeneity in the early solar system
N79-33126
ROCHESTER UNIV., N. Y.
Experimental studies of valence instabilities
[AD-A070352] N79-32306
ROCKWELL INTERNATIONAL CORP., ANAHEIM, CALIF.
High power phase locked laser oscillators
[NASA-CR-159630] N79-32538
Exploratory development on silicon material for LADIR
[AD-A070740] N79-33017
ROCKWELL INTERNATIONAL CORP., LOS ANGELES, CALIF.
HiMAT structural development design methodology
[NASA-CR-144886] N79-32197
ROCKWELL INTERNATIONAL CORP., THOUSAND OAKS, CALIF.
Intercell ohmic contacts for high efficiency multijunction solar converters
N79-32673
ROCKWELL INTERNATIONAL SCIENCE CENTER, THOUSAND OAKS, CALIF.
NDE method for characterizing anodized Al surfaces
[AD-A070936] N79-32337
Proceedings of the ARPA/AFML Review of Progress in Quantitative Nondestructive Evaluation
[AD-A071047] N79-32563
ROME AIR DEVELOPMENT CENTER, GRIFFISS AFB, N.Y.
Radiation pattern sidelobes and null filling produced by aircraft vibration
[AD-A070472] N79-32422
Metal grid angular filters for sidelobe suppression
[AD-A070111] N79-32424

A study of the scanning properties of some simple reflections
[AD-A070112] N79-32434
Application of Bayesian techniques to reliability demonstration, estimation and updating of the prior distribution
[AD-A070236] N79-32559
ROYAL AIRCRAFT ESTABLISHMENT, BEDFORD [ENGLAND].
Aerodynamic data for three supercritical airfoils: RAE[NPL]9515 and 9530, and RAE 9550. Parts 1 and 2
[ARC-R/M-3820] N79-32178
ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH [ENGLAND].
Wind tunnel tests on cambered wings of mild gothic planform. Part 1: Further low speed tests. Part 2: Transonic tests
[ARC-R/M-3827] N79-32179
Measured blockage effects on bluff bodies in closed and open wind tunnels
[RAE-TR-78151] N79-32182
Trials of the Doppler microwave landing system at London [Gatwick] Airport, August 1977
[RAE-TR-78124] N79-32194
Trials of the Doppler microwave landing system at Manchester International Airport, October/November 1977
[RAE-TR-78144] N79-32195
The design of an error detection and correction system for use with single track airborne digital magnetic recording systems
[RAE-TM-IT-171] N79-32534
The axial loading corrosion fatigue properties of 25mm thick high and low strength X166 plate [DTD 5120 and DTD 5130]
[RAE-TR-78114] N79-32600
ROYAL INST. OF TECH., STOCKHOLM [SWEDEN].
Electromagnetic shielding formulas
[TRITA-EPP-79-01] N79-32449
Electric fields in the outer magnetosphere: Recent progress and outstanding problems
[TRITA-EPP-79-03] N79-32783
An electric current model of the magnetosphere
[TRITA-EPP-79-09] N79-32784
Design of software tools for microprogrammable microprocessors
[TRITA-NA-79-03] N79-32886
On numerical analysis in semi-infinite programming
[TRITA-NA-79-07] N79-32887
On maximum error and boundary conditions in cubic spline interpolation at equidistant knots
[TRITA-NA-79-02] N79-32938
Some properties of linear multistep and one-leg methods for ordinary differential equations
[TRITA-NA-79-04] N79-32939
Generalized disks of contractivity for explicit and implicit Runge-Kutta methods
[NASA-CR-162125] N79-32940
Some stability properties of linear multistep compound discretizations of partitioned differential syems
[TRITA-NA-79-10] N79-32941
Computations related to G-stability of linear multistep methods
[TRITA-NA-79-11] N79-32942
Microtron injector for LEP
[TRITA-EPP-79-05] N79-33009
On the scaling of magnetic plasma confinement under classical conditions
[TRITA-PFU-79-05] N79-33064
Fast magnetosonic wave spectrum in a transversely magnetized plasma cavity
[TRITA-PFU-79-06] N79-33065
On search performance for conjunctive queries in compressed, fully transposed ordered files
[TRITA-NA-79-08] N79-33104
Hubble expansion in a Euclidean framework
[TRITA-EPP-79-07] N79-33133
An annihilation model of the QSO's
[TRITA-EPP-79-08] N79-33134
RUHR UNIV., BOCHUM [WEST GERMANY].
Heating of spherical interplanetary particles close to the sun [solar probe HELIOS A and B: Experiment 10 z]
[BMFT-FB-W-78-33] N79-33145

S

SAARBERGWERKE A.G. SAARBRUEKEN [WEST GERMANY].
Engineering study of the flue gas desulfurization unit for the power plant Weiher 3
[BMFT-FB-T-78-28] N79-32751
SANDIA LABS., ALBUQUERQUE, N. MEX.
Optimal terrain-aided navigation systems
[SAND-78-0874C] N79-32190
Microstructural evaluation and non-destructive examination of 2.25 Cr-1 Mo steel
[SAND-77-1557] N79-32340
Implantation metallurgy
[SAND-78-1089C] N79-32341
Observations of the vacuum arc and metal transfer during vacuum consumable arc remelting
[SAND-79-0922C] N79-32342
Fourier transform infrared analysis of plasma polymerized 2-vinylpyridine thin films
[SAND-78-0761C] N79-32366
Fuels from magma: A potential energy source
[SAND-78-0191] N79-32373
Passivation of the pyrotechnic fuels titanium and titanium hydride in oxidative environments
[SAND-78-0264C] N79-32378
Dielectric stimulated arcs in lightning arrestor connectors
[SAND-79-0396C] N79-32480
Performance testing of the Del concentrating solar collector
[SAND-79-0515] N79-32681
Corrosion in molten salts used for solar thermal storage applications
[SAND-79-0246C] N79-32683
Thermal energy storage for advanced solar central receiver power systems
[SAND-78-8221] N79-32694
Heliostat beam characterization system
[SAND-79-0697C] N79-32703
Structural optimization of sheet mokling compound line focusing collectors
[SAND-79-0215C] N79-32710
Solar radiation model validation
[SAND-79-1120C] N79-32712
Availability of wind power
[SAND-78-0548C] N79-32719
Seismic determination of impact times of supersonic projectiles
[SAND-78-1077] N79-32775
Wind power climatology of the United States, supplement
[SAND-78-1620] N79-32811
Development of multifunctional sea-floor instrumental systems
[SAND-78-0781C] N79-32820
Brief instructions for using the Sandia Mathematical Subroutine Library [version 7.2]
[SAND-77-1441] N79-32924
SLINEQ: A code to solve systems of linear equations and inequalities
[SAND-78-1442] N79-32925
Application of ion channeling to radiation damage studies
[SAND-79-0497C] N79-32990
Sandia's particle beam fusion program
[SAND-79-0600C] N79-33005
Hydrogen retention and release in first-wall coatings for Tokamaks
[SAND-78-2128C] N79-33055
High current pulsed linear ion accelerators for inertial fusion applications
[SAND-78-0778C] N79-33056
SANDIA LABS., LIVERMORE, CALIF.
Computational nature of combustion modeling
[SAND-78-8245] N79-32313
Experimental determination of the equation of state of explosives and pyrotechnics used in explosive actuators
[SAND-78-8628] N79-32392
Recent advances in thermochemical energy storage and transport
[SAND-78-8505] N79-32720
SATTLEGER INGENIEURBUERO FUER ANGEWANDTE GEOPHYSIK, MEPPEN [WEST GERMANY].
Improvement of the MVD method [Migration Velocity Determination]
[BMFT-FB-T-78-30] N79-32779
SCIENCE APPLICATIONS, INC., LA JOLLA, CALIF.
Analytic approaches to unstable resonators
[AD-A071024] N79-32473
SCIENCE APPLICATIONS, INC., PLEASANTON, CALIF.
Habitat and logistic support requirements for the initiation of a space manufacturing enterprise
N79-32229
SCIENCE APPLICATIONS, INC., TUCSON, ARIZ.
Neptune: Limb brightening within the 7300 angstrom methane band
[NASA-CR-162319] N79-33122
SHE CORP., SAN DIEGO, CALIF.
The 3 kHz SQUID receiver development
[AD-A069709] N79-32429
SIEMENS A.G., MUNICH [WEST GERMANY].
Optimization of future telecommunication network structures
[BMFT-FB-T-78-55] N79-32448
Modern technology for semiconductor devices
[BMFT-FB-T-78-21] N79-32484
New functionally integrated circuits
[BMFT-FB-T-78-37] N79-32485
Ferrites with anomalous hysteresis loops for communication systems
[BMFT-FB-T-78-54] N79-32488
SMITH [WILBUR] AND ASSOCIATES, WASHINGTON, D. C.
Characteristics of urban transportation demand; appendix
[PB-294989/9] N79-33112

SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS.
Investigation of the long-wavelength gravity field of the oceans
[AD-A064662] N79-32818
SOLAREX CORP., ROCKVILLE, MD.
Thin cells for space
N79-32652
SOUTH CAROLINA UNIV., COLUMBIA.
Asymptotic rounds for solutions to a system of damped integrodifferential equations of electromagnetic theory
[AD-A070132] N79-32432
Suspended sediment in breaking waves
N79-32817
SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
Experimental methods for aircraft design qualifications in an exploding warhead environment
[AD-A070381] N79-32203
SPIRE CORP., BEDFORD, MASS.
Applications of ion implantation to high performance, radiation tolerant silicon solar cells
N79-32648
SRI INTERNATIONAL CORP., ARLINGTON, VA.
Nucleation and growth of cracks in CVD ZnS under particle impact, part 2
[AD-A069528] N79-32364
SRI INTERNATIONAL CORP., MENLO PARK, CALIF.
Mission analysis for the federal fuels from biomass program. Volume 4: Thermochemical conversion of biomass to fuels and chemicals
[SAN-0115-T3] N79-32384
Mission analysis for the Federal Fuels from biomass program. Volume 1: Summary and conclusions
[SAN-0115-T2] N79-32385
STANFORD UNIV., CALIF.
Transient flow of non-Newtonian power-law fluids in porous media
[SAN-1265-9] N79-32516
Highly efficient transducer arrays useful in nondestructive testing applications
[AD-A070725] N79-32562
Some problems of validation and testing of numerical air pollution models
[COO-2874-41] N79-32749
Extrapolation of asymptotic expansions by a modified Aitken delta sup 2 formula
[SU-326-P-30-61] N79-32882
Note on the practical significance of the Drazin inverse
[NASA-CR-162307] N79-32907
Variational description of the positive column with two-stem ionization
[NASA-CR-162314] N79-33035
The integrated computer database as a medium for the management and access of textual information
N79-33099
Control system designs for the shuttle infrared telescope facility
[NASA-CR-162321] N79-33121
STATE UNIV. OF NEW YORK AT ALBANY.
Limnology of Lake Champlain
[PB-295612/6] N79-32625
High-energy electron-induced damage production at room temperature in aluminum-doped silicon
N79-32662
Pseudopotential methods in the calculation of electronic properties and quadrupole interactions in metals
N79-33074
STATE UNIV. OF NEW YORK AT STONY BROOK.
A microstructural investigation of plasma-sprayed metal and oxide coatings
N79-32320
Deformation twinning and its role in the cavitation erosion response of HCP Co single crystals
N79-33078
STATE UNIV. OF NEW YORK COLL. OF ENVIRONMENTAL SCIENCE AND FORESTRY, SYRACUSE.
Laser Doppler electrophoresis and the mobility of colloidal particles
N79-32297
Binding of anionic dyes to cation-specific poly [crown ethers]
N79-32356
STD RESEARCH CORP., ARCADIA, CALIF.
Magnetogasdynamic phenomena in pulsed MHD flows
[AD-A070590] N79-33042
STOCKHOLM UNIV. [SWEDEN].
A bulk model of the atmospheric planetary boundary layer
[DM-28] N79-32790
STUTTGART UNIV. [WEST GERMANY].
Effect of sheet metal thickness on crack propagation
[ISD-240] N79-32593
Research report, 1977
N79-33059
The enlargement of fast avalanche photodiode bandwidths by capacitance compensation
[IPF-77-3] N79-33060
Analytical treatment of runaway effects
[IPF-77-4] N79-33061

SUMMERS [W. K.] AND ASSOCIATES, INC., SOCORRO, N. MEX.
Survey of the ground-water geology and hydrology of the Pasco Basin, Washington
[RHO-BWI-C-41] N79-32616
SYRACUSE UNIV., N. Y.
Exploratory study of the dynamic fracture ductility of TRIP and 300M steels
[AD-A069909] N79-32338
SYSTEMS TECHNOLOGY, INC., MOUNTAIN VIEW, CALIF.
Powered-lift aircraft handling qualities in the presence of naturally-occurring and computer-generated atmospheric disturbances
[AD-A072118] N79-32198

T

TECHNISCHE UNIVERSITAET, MUNICH [WEST GERMANY].
Aspects of the performance of chemical rocket thrust systems
[TUM-LRT-RT-TB-78/3] N79-32263
Measurement of the velocity of small projectiles using microwaves
[TUM-LRT-RT-TB-77/01] N79-32444
Application of various theories to kinematic shimmy studies
[TUM-MW-14-7701] N79-32550
TECHNOLOGY SERVICE CORP., SANTA MONICA, CALIF.
Design of an improved air quality telemetry system
[PB-296076/3] N79-32259
TELESPAZIO, S.P.A., ROME [ITALY].
Evaluation of water transparency measurements derived from LANDSAT data and ground truth: An example from the Tiber River mouth
[E79-10285] N79-32609
Feature selection via entropy minimization: An example using LANDSAT satellite data
[E79-10286] N79-32610
TENNESSEE UNIV., KNOXVILLE.
Estimation of the operating characteristics of item response categories. 7: Bivariate P.D.F. approach with normal approach with normal approach method
[AD-A070130] N79-32950
TENNESSEE UNIV. SPACE INST., TULLAHOMA.
Some aerodynamic performance calculations on missile configurations
[AD-A070433] N79-32168
TEXAS A&M UNIV., COLLEGE STATION.
Modelling and system identification for the inphase/quadrature process
N79-32407
Dynamic response of a rotating, balanced, flexible shaft supported by a thermodynamic bearing system
N79-32549
Frontal dynamics of a Gulf Stream ring
N79-32816
An experimental natural-language processor for generating data type specifications
N79-32847
A statistical methodology for constructing synthetic test workloads
N79-32865
A nonlinear multiprocessor scheduling problem
N79-32869
Polarization transfer in inelastic proton scattering
N79-32992
TEXAS INSTRUMENTS, INC., DALLAS.
Design considerations for the Tandem Junction Solar Cell
N79-32651
TEXAS UNIV. AT AUSTIN.
Fatigue behavior of TiNi alloy
N79-32319
A study of homogeneous reduction of carbon monoxide to hydrocarbons and methanol
N79-32368
Asymptotically optimum zero memory detectors for dependent noise process
[AD-A069982] N79-32433
Shear wave propagation in unconsolidated fluid saturated porous media
N79-32490
Experimental superposition of acoustic fields for detection performance studies
[AD-A070963] N79-32970
A summary of the results of a study of acoustic interaction with the sea floor
[AD-A070954] N79-32973
Lateral diffusion in model membranes by pulsed nuclear magnetic resonance
N79-32978
A theoretical and experimental study of the thermal properties of xenon adsorbed on graphite
N79-33071
Astronomical spectroscopy through real time computer control of photodiode array detectors
N79-33120
TEXAS UNIV. AT DALLAS, RICHARDSON.
Auroral data analysis
[AD-A070180] N79-32770
TEXTRON BELL AEROSPACE CO., BUFFALO, N. Y.
Weldability of formable sheet titanium alloy Ti-15V-3Cr-3Al-3Sn
[AD-A070747] N79-32332
TRANSPORTATION SYSTEMS CENTER, CAMBRIDGE, MASS.
The costs and benefits of a mid-continent expansion of Loran-C
[PB-294614/3] N79-32196
Proceedings of the 4th US-German Urban Transportation Workshop
[PB-294972/5] N79-33113
TRINITY UNIV., SAN ANTONIO, TEX.
A theoretical investigation of power and control configurations for a high g-onset centrifuge drive system
[AD-A070912] N79-32841
TRW, INC., MCLEAN, VA.
Methane recovery from coalbeds project technology test projects evaluation of candidate projects
[DOE/TIC-10128] N79-32390
TULANE UNIV., NEW ORLEANS, LA.
Planar deformation of granular materials
N79-33075

U

UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.
Water-cooled turbine blade technology study
[PB-295892/4] N79-32215
UNIVERSITE CATHOLIQUE DE LOUVAIN [BELGIUM].
Atmospheric propagation research at 20 and 30 GHz
[ESA-CR[P]-1201] N79-32447
UNIVERSITY OF SOUTHEASTERN MASSACHUSETTS, NORTH DARTMOUTH.
Geothermal power plants of the Soviet Union. A technical survey of existing and planned installations
[COO-4051-41] N79-32686
UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES.
The oblique wing as a lifting-line problem in transonic flow
[AD-A070232] N79-32166
Real-time nonlinear optical information processing
[AD-A071541] N79-32899
UPPSALA IONOSPHERIC OBSERVATORY [SWEDEN].
Lower ionosphere ion production density and composition in an auroral absorption event
[UIO-SR-79-01] N79-32791
UTAH DEPT. OF TRANSPORTATION, SALT LAKE CITY.
Prevention of early pavement deterioration
[PB-296337/9] N79-32402
UTAH STATE UNIV., LOGAN.
Design and development of a telemetry logging system
[AD-A070310] N79-32258
UTAH UNIV., SALT LAKE CITY.
Continuum modeling of damage accumulation and ultimate failure in fiber reinforced laminated composite materials
N79-32270

V

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Characteristic damage states in composite laminates
N79-32273
A millimeter wave attenuation and depolarization experiment using the COMSTAR and CTS satellites
[NASA-CR-162315] N79-32442
Effect of compressibility, suction, and heat transfer on the nonparallel stability of boundary-layer flows
N79-32494
Nonparallel stability of two-dimensional nonuniformly heated boundary-layer flows
[NASA-CR-162309] N79-32499
Liquid fuel jet injection into a simulated subsonic dump combustor
[AD-A071028] N79-32509
Prediction of the recognition of real objects as a function of photometric and geometric characteristics
[AD-A071118] N79-32614
Parametrically excited nonlinear multidegree-of-freedom systems
N79-32967

W

WASHINGTON UNIV., SEATTLE.
Multiple scattering effects on transmission through the atmosphere
[AD-A070471] N79-32419
On the complexity of d-dimensional Voronoi diagrams
[AD-A070098] N79-32912
Diameters of random graphs
[AD-A070099] N79-32916
Random bipartite graphs: Connectedness, isolated nodes, diameters
[AD-A070100] N79-32917
On-board transit origin-destination survey data: Expanding their use via on-line data access and analysis
[PB-294967/5] N79-33114
WATER PURIFICATION ASSOCIATES, CAMBRIDGE, MASS.
Water related environmental effects in fuel conversion. 1: Summary volume
[FE-2445-1-VOL-1] N79-32747
WEAPONS RESEARCH ESTABLISHMENT, SALISBURY [AUSTRALIA].
Calculation of subsonic normal force and centre of pressure position of bodies of revolution using a slender body theory: Boundary layer method
[WSRL-0093-TR] N79-32160
WESLEYAN UNIV., MIDDLETOWN, CONN.
Extension of the heat pulse technique to the minute heat capacities of thin films at low temperatures
N79-32491
The dissipation of cosmic magnetic fields
N79-33128
WEST VIRGINIA UNIV., MORGANTOWN.
Reliability analysis and optimum maintenance scheduling of molded-case circuit breakers
N79-32461
Impacts of the Resource Conservation and Recovery Act on the siting of coal-conversion energy facilities in the United States
[ORNL/OEPA-12] N79-32724
WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER, PITTSBURGH, PA.
GaAs/AlGaAs herterojunction gate field effect transistor
[AD-A070081] N79-33082
WISCONSIN UNIV. - MADISON.
Measured effects of boundary conditions on oxides of nitrogen produced by liquid fuel diffusion flames
N79-32302
Techniques for observation and control of high voltage spark discharge
N79-32460
The solution of the axisymmetric elastic-plastic torsion of a shaft using variational inequalities
[AD-A070207] N79-32583
Apex singularities for corner cracks under opening, sliding, and tearing modes
[AD-A070200] N79-32587
Temperature based stress analysis of notched members
[AD-A070372] N79-32589
CHEOPS: A project for evaluating ANSI/SPARC architecture
[AD-A070218] N79-32854
Query execution in DIRECT
[AD-A070195] N79-32856
Definition and use of attribute reevaluation in attributed grammars
N79-32863
Locally least-cost error correctors for context-free and context-sensitive parsers
N79-32871
Searching for solutions of finite nonlinear systems: An interval approach
N79-32903
A comparison of the existence theorems of Kantorovich and Moore
[AD-A070203] N79-32908
Theory of connectivity: A unified approach to boundary methods
[AD-A070198] N79-32909
Efficient higher order single step methods for parabolic problems, part 1
[AD-A070217] N79-32910
Collocation approximation to eigenvalues of an ordinary differential equation: The principle of the thing
[AD-A070197] N79-32913
Some relations between nonexpansive and order preserving mappings
[AD-A070202] N79-32918
Variational principles for problems with linear constraints. Prescribed jumps and continuation type restrictions
[AD-A070199] N79-32919
Error estimates for mixed methods
[AD-A070196] N79-32920
Asymptotic distributions of slope of greatest convex minorant estimators
[AD-A070205] N79-32921
Efficient time-stepping methods for miscible displacement problems with nonlinear boundary conditions
[AD-A070211] N79-32922
On systems of toda type
[AD-A070216] N79-32923
A Bayesian approach to random coefficient models
N79-32944
Robustness in the strategy of scientific model building
[AD-A070213] N79-32945

A comparison of sampling plans for Bayesian estimation of a Poisson process rate
[AD-A070215] N79-32948
The construction of Jacobi and periodic Jacobi matrices with prescribed spectra
[AD-A070214] N79-32951
Global and superlinear convergence of a class of variable metric methods
[AD-A070204] N79-32959
Local and superlinear convergence of a class of variable metric methods
[AD-A070208] N79-32960
On the rate of superlinear convergence of a class of variable metric methods
[AD-A070209] N79-32961

WISCONSIN UNIV. - MILWAUKEE.
Modular calorimeter system for use in high energy physics
[COO-3071-239] N79-32994

Y

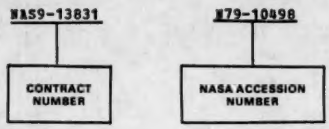
YALE UNIV., NEW HAVEN, CONN.
Inelastic electronic collision in hydrocarbons and dyes
[AD-A070172] N79-32986

Z

ZIA ASSOCIATES, INC., BOULDER, COLO.
Heat pump/rock bed storage systems
[COO-4704-2] N79-32705

CONTRACT NUMBER INDEX

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

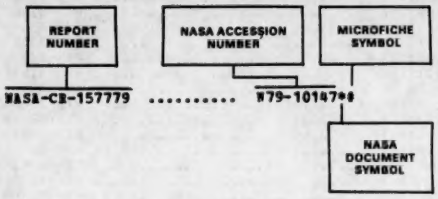
AC-04-76-DP-00789
N79-32811
AF PROJ. 0071
N79-32428
AF PROJ. 1123
N79-32832
AF PROJ. 2001
N79-33023
AF PROJ. 2037
N79-32554
AF PROJ. 2128
N79-32772
AF PROJ. 2301
N79-32473
N79-32543
AF PROJ. 2303
N79-32309
N79-32365
N79-32984
N79-32985
AF PROJ. 2304
N79-32432
N79-32510
N79-32896
N79-32898
N79-32911
N79-32946
N79-32953
N79-32954
AF PROJ. 2305
N79-32422
N79-32433
N79-32434
N79-32435
AF PROJ. 2306
N79-32471
N79-33018
N79-33081
AF PROJ. 2307
N79-32167
N79-32588
N79-32589
AF PROJ. 2308
N79-32509
AF PROJ. 2312
N79-32897
AF PROJ. 2313
N79-32833
N79-32840
N79-32841
N79-32842
AF PROJ. 2338
N79-32476
N79-32559
AF PROJ. 2401
N79-32183
AF PROJ. 2402
N79-32170
N79-32363
AF PROJ. 2403
N79-32880
AF PROJ. 2404
N79-32173
AF PROJ. 2418
N79-32337
AF PROJ. 3145
N79-32468
AF PROJ. 3763
N79-32420
AF PROJ. 4600
N79-32424
AF PROJ. 7351
N79-32560
N79-32563
AF PROJ. 7381
N79-32201
AF PROJ. 7663
N79-32770
AF PROJ. 8219
N79-32250
AF PROJ. 9751
N79-33043
AF-AFOSR-2668-74
N79-33043
AF-AFOSR-2812-75
N79-32510
AF-AFOSR-2946-76
N79-32896
AF-AFOSR-2973-76
N79-32833
AF-AFOSR-3062-76
N79-32433
AF-AFOSR-3063-76
N79-32898
AF-AFOSR-3104-76
N79-32262
AF-AFOSR-3152-77
N79-32897
AF-AFOSR-3155-77
N79-33081
AF-AFOSR-3194-77
N79-32589
AF-AFOSR-3285-77
N79-32899
AF-AFOSR-3342-77
N79-32420
AF-AFOSR-3396-77
N79-32432
AF-AFOSR-3485-78
N79-32509
AF-AFOSR-3519-78
N79-32911
N79-32946
AF-AFOSR-3552-78
N79-32435
AF-AFOSR-3565-78
N79-32309
AF-AFOSR-3622-78
N79-32841
AF-AFOSR-3678-78
N79-32954
ARPA ORDER 2935
N79-32430
ARPA ORDER 3300
N79-32853
ARPA ORDER 3336
N79-33091
ARPA ORDER 3345
N79-32438
BNFT-NT-312 N79-32484
BNFT-NT-372 N79-32483
BNFT-NT-466 N79-32486
BNFT-NT-637 N79-32535
BNFT-NT-0051 N79-32531
BNFT-NT-0442 N79-33151
BNFT-NT-0525 N79-32488
BNFT-NT-0580 N79-33025
BNFT-NT-0619 N79-32485
BNFT-NT-0630 N79-32448
BNFT-PLR-ET-1399-C
N79-32393
BNFT-WRK-0274
N79-32247
N79-32253
BNFT-WRS-0107-I
N79-33132
BNFT-WRS-01081
N79-33145
BNFT-WRT-1075
N79-32244
N79-32445
N79-32532
BNFT-WRT-1076
N79-32245
BNFT-WRT-1077
N79-32246
BNFT-03E-1012-A/ETS-6000-A
N79-32751
BNFT-03E-1399-A/ETS-0004-1
N79-32394
BNFT-03E-3118-A/ETS-0003-A
N79-32779
BNFT-03E-4055-C/ETS-8000
N79-32730
BNFT-03E-5001-A/ETS-0004-A
N79-32282
BNFT-03E-5211-A/ETS-0004-A
N79-32732
DA PROJ. 1L1-61102-AH-42
N79-32329
DA PROJ. 1L1-62120-AH-25
N79-32427
DA PROJ. 1P6-65702-D-127
N79-32808
DA PROJ. 1T6-65702-D-126
N79-32809
DA PROJ. 1W3-62303-A-214
N79-33014
DA-ARO(D)-31-124-72-G121
N79-33080
DA-ARO(D)-31-124-73-G66
N79-32986
DAAA09-74-C-2062
N79-32336
DAAB07-72-C-0259
N79-32855
DAAB07-76-C-0041
N79-32472
DAAB07-76-C-8135
N79-33021
DAAB07-77-C-2681
N79-33022
DAAG29-75-C-0024
N79-32583
N79-32587
N79-32854
N79-32856
N79-32908
N79-32909
N79-32910
N79-32913
N79-32919
N79-32920
N79-32921
N79-32922
N79-32923
N79-32945
N79-32948
N79-32951
N79-32959
N79-32960
N79-32961
DAAG29-76-C-0018
N79-32514
DAAG29-76-G-0035
N79-32974
DAAG29-76-G-0101
N79-32986
DAAG29-76-G-0138
N79-32771
DAAG29-76-G-0167
N79-32947
DAAG29-76-G-0171
N79-32306
DAAG29-76-G-0311
N79-32328
DAAG29-77-G-0083
N79-32442
DAAG29-77-G-0106
N79-33080
DAAG29-77-G-0108
N79-32168
DAAG29-78-G-0161
N79-32922
DAAG46-77-C-0019
N79-32338
DAAJ02-76-C-0057
N79-32335
DAAJ02-77-C-0028
N79-32174
DAAK11-77-C-0043
N79-32203
DAAK40-78-C-0070
N79-33020
DAAK40-78-H-0077
N79-33016
DAAK70-78-C-0100
N79-33083
DAAK70-78-D-0002
N79-32674
DAA46-75-C-0096
N79-32275
DACA39-76-M-0248
N79-32878
DACA39-77-M-0107
N79-32878
DAHC04-74-G-0161
N79-32771
DAHC04-74-G-0199
N79-33080
DAHC04-75-G-0151
N79-33080
DAHC19-74-G-009
N79-32614
DARPA ORDER 3387
N79-33019
DARPA ORDER 3441
N79-33089
DE-AC04-76-DP00789
N79-32342
N79-32990
N79-33055
DFG-AR-44/34 N79-32593
DFVLR-BPT-01-D1-173
N79-32253
DFVLR-BPT-01-OR-036
N79-32247
DFVLR-BPT-01-OO-015-A
N79-32532
DFVLR-BPT-01-OO-187
N79-32246
DFVLR-BPT-01-QV-316
N79-32245
DFVLR-BPT-01-YA-016
N79-32244
DFVLR-BPT-01-YC-015
N79-32445
DFVLR-01-BPT-QC-036A
N79-33145
DOT-FA73WAI-384
N79-32805
DOT-FA76WA-3788
N79-32206
DOT-FA77WA-3936
N79-32198
DOT-FA77WAI-704
N79-32218
DOT-FA77WAI-723
N79-32969
DOT-FA77WAI-774
N79-32417
DOT-TSC-1237 N79-32856
DOT-TSC-1241 N79-33109
N79-33110
EG-77-C-01-2522
N79-32715

EG-77-C-01-4042
N79-32374
N79-32688
N79-32689
EG-77-C-01-4068
N79-32443
EG-77-C-03-1459
N79-32701
EG-77-C-03-1579
N79-32668
EG-77-C-03-1712
N79-32668
EG-77-S-02-4393
N79-33057
EG-77-S-02-4523
N79-32682
EM-78-C-02-4704
N79-32705
EM-78-C-04-5319
N79-32708
EPA-68-01-3924
N79-33011
EPA-68-02-2133
N79-32756
EPA-68-02-2606
N79-32754
N79-32755
EPRI PROJ. 553
N79-32687
EPRI PROJ. 922
N79-33004
ESTEC-3143/77-NL-AK(SC)
N79-32487
ESTEC-3305/77-NL-AK(SC)
N79-32447
ET-78-C-08-1555
N79-32546
EW-78-C-21-8089
N79-32390
EW-78-S-02-4691
N79-32386
EW-78-X-03-1038
N79-32717
EX-76-C-01-1775
N79-32591
EX-76-C-01-2240
N79-32382
EX-76-C-01-2445
N79-32747
EX-76-C-01-2469
N79-32391
EX-76-C-01-2489
N79-32380
EX-76-S-01-2234
N79-32375
EY-76-C-02-0016
N79-32367
N79-32387
N79-32388
N79-32704
N79-32718
N79-32722
EY-76-C-02-2764
N79-32713
EY-76-C-02-3071
N79-32994
EY-76-C-02-4094
N79-32700
N79-32702
EY-76-C-03-0010-021
N79-33051
EY-76-C-03-0115-131
N79-32385
EY-76-C-03-1265
N79-32516
EY-76-C-04-0053
N79-32680
EY-76-C-04-0613
N79-32478
EY-76-C-04-0789
N79-32190
N79-32313
N79-32340
N79-32341
N79-32366
N79-32373
N79-32378
N79-32392
N79-32480
N79-32681
N79-32683
N79-32691
N79-32694
N79-32703
N79-32710
N79-32712
N79-32719
N79-32720
N79-32775
N79-32820
N79-32924
N79-32925
N79-32990
N79-33005
N79-33056
EY-76-C-06-1030
N79-32616
EY-76-C-06-1830
N79-32692
N79-32709
N79-32828
N79-32995
EY-76-C-07-1570
N79-32998
EY-76-C-08-1183
N79-32777
EY-76-S-02-2874
N79-32749
EY-76-S-02-4051
N79-32685
N79-32686
N79-33096
EY-76-S-03-0326
N79-32942
EY-76-S-0326-030
N79-32882
EY-77-S-02-4589
N79-32379
FAA PROJ. 153-451
N79-32805
FHV-F-K-82223-76-001-21-001
N79-32348
F19628-76-C-0005
N79-32770
F19628-76-C-0010
N79-32769
F19628-76-C-0118
N79-33085
F19628-76-C-0261
N79-32250
F19628-77-C-0082
N79-32768
F19628-78-C-0002
N79-32425
N79-32426
N79-32438
N79-32772
N79-33013
N79-33091
F19628-78-C-0003
N79-32818
F19628-79-C-0001
N79-33015
F30602-75-C-0082
N79-32476
F30602-77-C-0145
N79-32428
F33615-71-C-1244
N79-32271
F33615-74-C-2037
N79-32468
F33615-74-C-5180
N79-32563
F33615-75-C-3052
N79-32250
F33615-75-C-3081
N79-32170
F33615-75-C-5232
N79-32332
F33615-76-C-0506
N79-32826
F33615-76-C-5024
N79-33017
F33615-76-C-5062
N79-32560
F33615-76-C-5108
N79-32365
F33615-77-C-1058
N79-33023
F33615-77-C-2048
N79-33044
F33615-77-C-3016
N79-32167
F33615-77-C-3072
N79-32880
F33615-77-C-3150
N79-32664
F33615-77-C-5009
N79-32201
F33615-77-C-5052
N79-33018
F33615-77-C-5215
N79-32337
F33615-78-C-2036
N79-32673
F33615-78-C-3406
N79-32363
F33657-71-C-1055
N79-32222
F44620-75-C-0023
N79-32953
F44620-76-C-0088
N79-32543
F49620-76-C-0017
N79-32984
F49620-77-C-0065
N79-33086
F49620-77-C-0071
N79-32985
F49620-77-C-0101
N79-32433
F49620-77-C-0116
N79-32840
F49620-78-C-0008
N79-32471
F49620-78-C-0024
N79-32554
F49620-78-C-0057
N79-32172
F49620-78-C-0079
N79-32473
GFW-01-H-3009-I
N79-33132
HRA-106-74-182
N79-32413
JPL PROJ. 5101-104
N79-32633
JPL PROJ. 5102-125
N79-32634
JPL PROJ. 5104-38
N79-32632
JPL-KH-68903 N79-32645
JPL-954883 N79-32652
JPL-955194 N79-32638
N79-32639
NDA903-75-C-0180
N79-32430
NDA903-77-C-0037
N79-32853
NASA ORDER S-40198-B
N79-32606
NASW-3134 N79-33122
NAS1-13918 N79-32161
N79-32162
N79-32163
N79-32164
NAS1-14289 N79-32540
NAS1-14727 N79-32664
NAS1-15154 N79-32210
NAS1-15369 N79-32157
NAS2-9883 N79-32219
NAS3-20376 N79-32538
NAS3-20377 N79-32326
NAS3-20795 N79-32551
NAS3-20823 N79-32648
NAS3-21018 N79-32303
NAS3-21250 N79-32652
NAS3-21256 N79-32211
NAS3-21276 N79-32648
NAS4-25600 N79-32197
NAS5-3991 N79-32603
NAS5-22577 N79-32442
NAS5-24264 N79-32604
NAS7-100 N79-32156
N79-32369
N79-32408
N79-32409
N79-32410
N79-32411
N79-32412
N79-32630
N79-32631
N79-32632
N79-32633
N79-32634
N79-32635
N79-32636
N79-32638
N79-32639
N79-32643
N79-32657
N79-32661
N79-32822
N79-32875
N79-33138
N79-33139
N79-33140
NAS8-31325 N79-32464
N79-32465
N79-32628
NAS8-33075 N79-32266
NAS8-33102 N79-32325
NAS8-33109 N79-32324
NAS8-33209 N79-32526
NAS8-33244 N79-32213
NAS9-15200 N79-32605
NAS9-15636 N79-32659
NCA2-OR/45-712
N79-32940
NGL-05-020-176
N79-33035
NGL-33-010-005
N79-33141
NIVR-1725 N79-32350
NIVR-1737 N79-32176
NIVR-1743 N79-32351
NIVR-1744 N79-32281
N79-32287
N79-32291
NIVR-1761 N79-32175
NIVR-1768 N79-32177
NIVR-1775 N79-32216
NIVR-1778 N79-32255
NIVR-1779 N79-32284
N79-32285
NIVR-1780 N79-32261
NIVR-1806 N79-32288
NIVR-1807 N79-32290
NIVR-1808 N79-32594
NIVR-1824 N79-32289
NIVR-1858 N79-32261
NR PROJ. 036-047
N79-32308
NR PROJ. 042-271
N79-32949
NR PROJ. 042-289
N79-32952
NR PROJ. 044-353
N79-32912
NR PROJ. 061-192
N79-32166
NR PROJ. 064-609
N79-32278
NR PROJ. 150-402
N79-32950
NR PROJ. 204-020
N79-32823
NR PROJ. 359-650
N79-32675
NSF AER-75-08809
N79-32215
NSF AER-75-20501
N79-32737
NSF AST-76-15521
N79-33133
N79-33134
NSF DMR-78-03015
N79-32360
NSF DSI-75-06942
N79-33108
NSF MCS-76-07236
N79-32910
NSF MCS-77-08968
N79-32856

NSF MCS-77-16974 N79-32921
NSF MCS-77-26732 N79-32583
NSF MCS-78-01721 N79-32856
NSF MCS-78-02737 N79-32920
NSF MCS-78-02851 N79-32920
NSF MCS-78-09525 N79-32910 N79-32921 N79-32922 N79-32923 N79-32951
NSG-1278 N79-32272
NSG-1306 N79-32876 N79-32877 N79-32906
NSG-1396 N79-32539
NSG-1409 N79-32574
NSG-1443 N79-32907
NSG-1474 N79-32210
NSG-1507 N79-32575
NSG-2246 N79-33121
NSG-3018 N79-32647
NSG-3066 N79-32212
N01-LS-4727 N79-32459
N00014-67-A-0103 N79-32912 N79-32916 N79-32917
N00014-67-A-0239 N79-33039 N79-33040
N00014-72-C-0318 N79-32505
N00014-75-C-0159 N79-32947
N00014-75-C-0293 N79-32440
N00014-75-C-0309 N79-33039 N79-33040
N00014-75-C-0376 N79-32511
N00014-75-C-0419 N79-32339
N00014-75-C-0451 N79-32949 N79-32955 N79-32956
N00014-75-C-0476 N79-33041
N00014-75-C-0520 N79-32166
N00014-75-C-0541 N79-32308
N00014-75-C-0580 N79-32584
N00014-75-C-0602 N79-33084
N00014-75-C-0632 N79-32562
N00014-75-C-0652 N79-32952
N00014-75-C-0661 N79-32879
N00014-75-C-0682 N79-32470
N00014-76-C-0037 N79-32331 N79-32585
N00014-76-C-0324 N79-32512 N79-32513
N00014-76-C-0328 N79-32823
N00014-76-C-0409 N79-32330
N00014-76-C-0410 N79-33036
N00014-76-C-0550 N79-32900
N00014-76-C-0657 N79-32364
N00014-76-C-0735 N79-33082
N00014-76-C-0976 N79-33088
N00014-77-C-0180 N79-32251
N00014-77-C-0353 N79-32675
N00014-77-C-0360 N79-32950
N00014-77-C-0542 N79-33089
N00014-77-C-0567 N79-32564
N00014-77-C-0574 N79-33042
N00014-77-C-0650 N79-32507
N00014-77-C-0711 N79-32360
N00014-77-G-0054 N79-32819
N00014-78-C-0113 N79-32973
N00014-78-C-0349 N79-32200 N79-32202
N00014-78-C-0458 N79-32615
N00014-78-C-0466 N79-33019
N00014-78-C-0543 N79-32824
N00014-78-C-0647 N79-32278
N00014-78-C-0649 N79-32506
N00014-78-C-0723 N79-32419
N00014-79-C-0012 N79-32361 N79-32362 N79-32475 N79-33090
N00014-79-F-0014 N79-32307
N00019-78-C-0131 N79-32431
N00019-79-C-0058 N79-32441
N00024-77-C-6251 N79-32470
N00024-78-C-5384 N79-32188
N00039-78-C-0307 N79-32970
N00039-78-G-0160 N79-32859
N00123-77-C-0996 N79-32153
N00140-77-C-0974 N79-32553
N00173-76-C-0313 N79-32469
N00173-77-C-0210 N79-32429
N00173-78-C-0129 N79-33087
N68305-76-0036 N79-32682
PROJ. 8999 N79-32707
RB-RLD-76008 N79-32192
RB-RLD-77007 N79-32192
RF54581001 N79-33082
RR0000101 N79-32914
RR0110941 N79-32503 N79-32508 N79-33038 N79-33046
RR0210203 N79-33088
RR0420401 N79-32950
SP5450059 N79-32333
SNSP-82.524.077 N79-32940
SRI PROJ. PYU-4928 N79-32364
SWED-NSRC-F-2569-007 N79-32935
W-31-109-ENG-38 N79-32482 N79-32620
N79-32697 N79-32699 N79-32711 N79-32745 N79-32748 N79-32750
W-7405-ENG-26 N79-32383 N79-32504 N79-32515 N79-32555 N79-32590 N79-32592 N79-32629 N79-32655 N79-32677 N79-32707 N79-32724 N79-32725 N79-32726 N79-32812 N79-33052 N79-33054 N79-33093 N79-33102
W-7405-ENG-36 N79-32377 N79-32477 N79-32481 N79-32518 N79-32530 N79-32565 N79-32678 N79-32679 N79-32690 N79-32698 N79-32706 N79-32714 N79-32716 N79-32728 N79-32913 N79-32988 N79-32989 N79-32991 N79-32996 N79-33050 N79-33058
W-7405-ENG-48 N79-32279 N79-32310 N79-32312 N79-32376 N79-32397 N79-32398 N79-32479 N79-32517 N79-32544 N79-32545 N79-32684 N79-32693 N79-32695 N79-32727 N79-32774 N79-32776 N79-32891 N79-32987 N79-33002 N79-33003 N79-33004 N79-33049 N79-33053 N79-33097 N79-33103
W-7405-ENG-82 N79-33092
W-7405-ENG-92 N79-32389
ZP5154004 N79-32831
ZP61512001 N79-32334
ZR0220101 N79-32327
505-02-54 N79-32151
505-06-23-05 N79-32498
505-06-43-08 N79-32159
505-07-10-02 N79-32205
505-08-21 N79-32265
505-09-13-11 N79-32743 N79-32744
505-11-23-05 N79-32500
506-16 N79-32359
506-16-43-11 N79-32358
506-23 N79-32467
506-26-11-07-00-21 N79-32152
516-58-11-01 N79-32185
517-53-43-02 N79-32158
524-71-03-02 N79-32277
619-12-20-01 N79-32797

REPORT / ACCESSION NUMBER INDEX

Typical Report/Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-7856 ..... N79-32265*#
A-7884 ..... N79-32185*#
A-7920 ..... N79-32205*#
A-7952 ..... N79-32152*#

AD-A062502 ..... N79-32826 #
AD-A064662 ..... N79-32818 #
AD-A064740 ..... N79-32769 #
AD-A064741 ..... N79-32768 #
AD-A068268 ..... N79-32206 #
AD-A069469 ..... N79-32819 #
AD-A069517 ..... N79-32365 #
AD-A069527 ..... N79-32251 #
AD-A069528 ..... N79-32364 #
AD-A069535 ..... N79-32564 #
AD-A069542 ..... N79-32174 #
AD-A069544 ..... N79-32511 #
AD-A069545 ..... N79-32262 #
AD-A069549 ..... N79-32859 #
AD-A069550 ..... N79-32900 #
AD-A069564 ..... N79-32974 #
AD-A069565 ..... N79-32956 #
AD-A069566 ..... N79-32955 #
AD-A069567 ..... N79-32954 #
AD-A069583 ..... N79-32442*#
AD-A069584 ..... N79-32513 #
AD-A069585 ..... N79-32512 #
AD-A069589 ..... N79-32441 #
AD-A069596 ..... N79-32514 #
AD-A069709 ..... N79-32429 #
AD-A069891 ..... N79-32199 #
AD-A069909 ..... N79-32338 #
AD-A069947 ..... N79-32435 #
AD-A069965 ..... N79-32339 #
AD-A069976 ..... N79-32880 #
AD-A069978 ..... N79-32840 #
AD-A069980 ..... N79-32953 #
AD-A069982 ..... N79-32433 #
AD-A069983 ..... N79-32833 #
AD-A070009 ..... N79-32806 #
AD-A070013 ..... N79-32202 #
AD-A070016 ..... N79-33086 #
AD-A070017 ..... N79-33081 #
AD-A070022 ..... N79-32200 #
AD-A070023 ..... N79-32947 #
AD-A070025 ..... N79-32949 #
AD-A070026 ..... N79-32823 #
AD-A070036 ..... N79-32153 #
AD-A070038 ..... N79-32898 #
AD-A070039 ..... N79-32674 #
AD-A070040 ..... N79-33014 #
AD-A070043 ..... N79-32501 #
AD-A070052 ..... N79-32472 #
AD-A070054 ..... N79-32307 #
AD-A070068 ..... N79-32309 #
AD-A070069 ..... N79-32985 #
AD-A070078 ..... N79-32468 #
AD-A070079 ..... N79-32897 #
AD-A070080 ..... N79-33036 #
AD-A070081 ..... N79-33082 #
AD-A070085 ..... N79-32914 #
AD-A070086 ..... N79-32895 #
AD-A070091 ..... N79-32436 #
AD-A070094 ..... N79-32810 #
AD-A070098 ..... N79-32912 #
AD-A070099 ..... N79-32916 #
AD-A070100 ..... N79-32917 #
AD-A070102 ..... N79-32502 #
AD-A070103 ..... N79-32966 #
AD-A070110 ..... N79-32437 #
AD-A070111 ..... N79-32424 #
AD-A070112 ..... N79-32434 #
AD-A070115 ..... N79-32855 #
AD-A070130 ..... N79-32950 #
AD-A070132 ..... N79-32432 #
AD-A070138 ..... N79-32911 #
AD-A070139 ..... N79-32189 #
AD-A070172 ..... N79-32986 #
AD-A070180 ..... N79-32770 #
AD-A070181 ..... N79-32431 #
AD-A070184 ..... N79-32188 #
AD-A070187 ..... N79-32808 #
AD-A070188 ..... N79-32370 #
AD-A070191 ..... N79-32221 #
AD-A070193 ..... N79-32588 #
AD-A070195 ..... N79-32856 #
AD-A070196 ..... N79-32920 #
AD-A070197 ..... N79-32913 #
AD-A070198 ..... N79-32909 #
AD-A070199 ..... N79-32919 #
AD-A070200 ..... N79-32587 #
AD-A070202 ..... N79-32918 #
AD-A070203 ..... N79-32908 #
AD-A070204 ..... N79-32959 #
AD-A070205 ..... N79-32921 #
AD-A070207 ..... N79-32583 #
AD-A070208 ..... N79-32960 #
AD-A070209 ..... N79-32961 #
AD-A070211 ..... N79-32922 #
AD-A070213 ..... N79-32945 #
AD-A070214 ..... N79-32951 #
AD-A070215 ..... N79-32948 #
AD-A070216 ..... N79-32923 #
AD-A070217 ..... N79-32910 #
AD-A070218 ..... N79-32854 #
AD-A070223 ..... N79-32423 #
AD-A070231 ..... N79-32832 #
AD-A070232 ..... N79-32166 #
AD-A070236 ..... N79-32559 #
AD-A070237 ..... N79-32183 #
AD-A070243 ..... N79-32853 #
AD-A070250 ..... N79-32250 #
AD-A070251 ..... N79-32170 #
AD-A070254 ..... N79-32167 #
AD-A070257 ..... N79-33016 #
AD-A070258 ..... N79-32471 #
AD-A070260 ..... N79-32857 #
AD-A070261 ..... N79-32223 #
AD-A070270 ..... N79-32881 #
AD-A070272 ..... N79-32946 #
AD-A070273 ..... N79-32896 #
AD-A070274 ..... N79-33015 #
AD-A070275 ..... N79-32831 #
AD-A070280 ..... N79-33085 #
AD-A070282 ..... N79-32773 #
AD-A070283 ..... N79-32421 #
AD-A070284 ..... N79-32541 #
AD-A070286 ..... N79-32879 #
AD-A070288 ..... N79-32858 #
AD-A070290 ..... N79-32207 #
AD-A070295 ..... N79-32971 #
AD-A070296 ..... N79-32327 #
AD-A070300 ..... N79-33037 #
AD-A070309 ..... N79-32328 #
AD-A070310 ..... N79-32258 #
AD-A070313 ..... N79-33080 #
AD-A070343 ..... N79-32222 #

AD-A070384 ..... N79-32675 #
AD-A070340 ..... N79-32469 #
AD-A070352 ..... N79-32306 #
AD-A070358 ..... N79-32771 #
AD-A070360 ..... N79-32824 #
AD-A070361 ..... N79-32503 #
AD-A070363 ..... N79-32169 #
AD-A070372 ..... N79-32589 #
AD-A070374 ..... N79-32678 #
AD-A070378 ..... N79-32676 #
AD-A070381 ..... N79-32203 #
AD-A070382 ..... N79-33013 #
AD-A070383 ..... N79-32553 #
AD-A070388 ..... N79-32420 #
AD-A070433 ..... N79-32168 #
AD-A070442 ..... N79-32256 #
AD-A070443 ..... N79-32257 #
AD-A070445 ..... N79-32220 #
AD-A070446 ..... N79-32165 #
AD-A070447 ..... N79-32430 #
AD-A070454 ..... N79-33079 #
AD-A070455 ..... N79-32438 #
AD-A070458 ..... N79-32807 #
AD-A070461 ..... N79-32972 #
AD-A070462 ..... N79-33047 #
AD-A070466 ..... N79-32586 #
AD-A070470 ..... N79-32470 #
AD-A070471 ..... N79-32419 #
AD-A070472 ..... N79-32422 #
AD-A070489 ..... N79-32809 #
AD-A070491 ..... N79-33041 #
AD-A070538 ..... N79-32187 #
AD-A070545 ..... N79-33045 #
AD-A070582 ..... N79-32915 #
AD-A070590 ..... N79-33042 #
AD-A070592 ..... N79-33040 #
AD-A070611 ..... N79-33039 #
AD-A070641 ..... N79-32952 #
AD-A070645 ..... N79-32371 #
AD-A070663 ..... N79-32171 #
AD-A070664 ..... N79-32308 #
AD-A070665 ..... N79-32201 #
AD-A070675 ..... N79-33083 #
AD-A070677 ..... N79-32333 #
AD-A070704 ..... N79-32528 #
AD-A070709 ..... N79-32508 #
AD-A070723 ..... N79-33022 #
AD-A070725 ..... N79-32562 #
AD-A070733 ..... N79-32476 #
AD-A070740 ..... N79-33017 #
AD-A070742 ..... N79-32507 #
AD-A070745 ..... N79-32331 #
AD-A070746 ..... N79-33023 #
AD-A070747 ..... N79-32332 #
AD-A070750 ..... N79-32361 #
AD-A070754 ..... N79-32506 #
AD-A070768 ..... N79-32362 #
AD-A070770 ..... N79-32615 #
AD-A070788 ..... N79-32585 #
AD-A070798 ..... N79-32584 #
AD-A070800 ..... N79-32329 #
AD-A070808 ..... N79-32475 #
AD-A070819 ..... N79-33044 #
AD-A070822 ..... N79-33090 #
AD-A070827 ..... N79-32440 #
AD-A070860 ..... N79-32334 #
AD-A070884 ..... N79-32427 #
AD-A070889 ..... N79-33046 #
AD-A070890 ..... N79-33038 #
AD-A070898 ..... N79-33020 #
AD-A070906 ..... N79-32330 #
AD-A070909 ..... N79-33019 #
AD-A070912 ..... N79-32841 #
AD-A070913 ..... N79-32336 #
AD-A070927 ..... N79-32360 #
AD-A070932 ..... N79-33018 #
AD-A070936 ..... N79-32337 #
AD-A070954 ..... N79-32973 #
AD-A070963 ..... N79-32970 #
AD-A070965 ..... N79-32542 #
AD-A070971 ..... N79-32543 #
AD-A071006 ..... N79-32772 #
AD-A071008 ..... N79-32426 #
AD-A071014 ..... N79-32425 #
AD-A071017 ..... N79-33043 #
AD-A071020 ..... N79-32172 #
AD-A071021 ..... N79-32984 #
AD-A071024 ..... N79-32473 #
AD-A071028 ..... N79-32509 #
AD-A071039 ..... N79-33088 #
AD-A071047 ..... N79-32563 #
AD-A071048 ..... N79-32505 #
AD-A071049 ..... N79-32554 #
AD-A071051 ..... N79-32335 #
AD-A071059 ..... N79-33087 #
AD-A071072 ..... N79-32983 #
AD-A071099 ..... N79-33048 #
AD-A071102 ..... N79-32560 #
AD-A071118 ..... N79-32618 #
AD-A071134 ..... N79-32561 #
AD-A071137 ..... N79-32510 #
AD-A071156 ..... N79-32439 #
AD-A071158 ..... N79-33021 #
AD-A071166 ..... N79-33089 #
AD-A071168 ..... N79-33091 #
AD-A071172 ..... N79-32474 #
AD-A071179 ..... N79-33084 #
AD-A071193 ..... N79-32428 #
AD-A071389 ..... N79-32278 #
AD-A071405 ..... N79-32363 #
AD-A071581 ..... N79-32899 #
AD-A071573 ..... N79-32173 #
AD-A071574 ..... N79-32842 #
AD-A072029 ..... N79-32969 #
AD-A072057 ..... N79-32417 #
AD-A072083 ..... N79-32414 #
AD-A072085 ..... N79-32416 #
AD-A072086 ..... N79-32415 #
AD-A072087 ..... N79-32418 #
AD-A072117 ..... N79-32218 #
AD-A072118 ..... N79-32198 #
AD-A072119 ..... N79-32805 #

AD-E400317 ..... N79-33079 #

AECL-6313 ..... N79-32999 #
AECL-6314 ..... N79-33000 #
AECL-6322 ..... N79-33001 #

AEDC-TR-79-13 ..... N79-32501 #
AEDC-TR-79-16 ..... N79-32223 #
AEDC-TR-79-21 ..... N79-32220 #
AEDC-TR-79-40 ..... N79-32165 #

AEDC-TSR-78-P54 ..... N79-32256 #
AEDC-TSR-78-V51 ..... N79-32169 #
AEDC-TSR-79-P10 ..... N79-32221 #
AEDC-TSR-79-V11 ..... N79-32257 #

AERONONICA-ACTA-A-198-1979 ..... N79-32763
AERONONICA-ACTA-A-199-1979 ..... N79-32764
AERONONICA-ACTA-A-200-1979 ..... N79-32794
AERONONICA-ACTA-A-201-1979 ..... N79-32795
AERONONICA-ACTA-A-202-1979 ..... N79-32765
AERONONICA-ACTA-A-203-1979 ..... N79-32766
AERONONICA-ACTA-A-204-1979 ..... N79-32767

AES-11730 ..... N79-32468 #

AFAL-TR-78-199 ..... N79-33023 #

AFAPL-TR-78-104 ..... N79-32468 #
AFAPL-TR-79-2038 ..... N79-33044 #

AFFDL-TR-76-55-VOL-1 ..... N79-32250 #
AFFDL-TR-78-77 ..... N79-32880 #
AFFDL-TR-78-157 ..... N79-32170 #
AFFDL-TR-78-176 ..... N79-32589 #
AFFDL-TR-79-3005 ..... N79-32167 #
AFFDL-TR-79-3006 ..... N79-32588 #
AFFDL-TR-79-3008 ..... N79-32203 #
AFFDL-TR-79-3066 ..... N79-32173 #

AFGL-TR-78-0180 ..... N79-32258 #
AFGL-TR-78-0271 ..... N79-32818 #
AFGL-TR-78-0282 ..... N79-32769 #
AFGL-TR-78-0302 ..... N79-32768 #
AFGL-TR-79-0071 ..... N79-32770 #

AFHRL-TR-78-98 ..... N79-32832 #

AFIT-CI-79-98D ..... N79-32586 #

AFIT/DS/AA/79M-1 ..... N79-32171 #
AFIT/GAE/AA/79J-1 ..... N79-32502 #

AFML-TR-76-125 ..... N79-33017 #
AFML-TR-78-117 ..... N79-32365 #

AFHL-TR-78-146 ..... N79-32337 #
AFHL-TR-78-179 ..... N79-32201 #
AFHL-TR-78-199 ..... N79-32332 #
AFHL-TR-78-205 ..... N79-32563 #
AFHL-TR-79-4023 ..... N79-32560 #
AFHL-TR-79-4043 ..... N79-33018 #

AFOSR-79-0543TR ..... N79-32954 #
AFOSR-79-0548TR ..... N79-32262 #
AFOSR-79-0647TR ..... N79-32953 #
AFOSR-79-0666TR ..... N79-32433 #
AFOSR-79-0669TR ..... N79-32840 #
AFOSR-79-0673TR ..... N79-32833 #
AFOSR-79-0689TR ..... N79-32435 #
AFOSR-79-0690TR ..... N79-32471 #
AFOSR-79-0693TR ..... N79-33086 #
AFOSR-79-0699TR ..... N79-32946 #
AFOSR-79-0702TR ..... N79-32896 #
AFOSR-79-0703TR ..... N79-32897 #
AFOSR-79-0719TR ..... N79-32911 #
AFOSR-79-0720TR ..... N79-32898 #
AFOSR-79-0723TR ..... N79-32432 #
AFOSR-79-0724TR ..... N79-33081 #
AFOSR-79-0726TR ..... N79-32985 #
AFOSR-79-0727TR ..... N79-32309 #
AFOSR-79-0736TR ..... N79-32543 #
AFOSR-79-0752TR ..... N79-33043 #
AFOSR-79-0769TR ..... N79-32509 #
AFOSR-79-0790TR ..... N79-32510 #
AFOSR-79-0797TR ..... N79-32984 #
AFOSR-79-0804TR ..... N79-32554 #
AFOSR-79-0805TR ..... N79-32172 #
AFOSR-79-0820TR ..... N79-32841 #
AFOSR-79-0833TR ..... N79-32473 #

AFRPL-TR-78-37 ..... N79-32370 #

AFWL-TR-78-163 ..... N79-32420 #

AGLT/RSU-SERIES-2/79 ..... N79-32622 #

ALCOA-57-77-24-REV ..... N79-32323 #

ALO-5319-1 ..... N79-32708 #

AMSRC-TR-79-8 ..... N79-32338 #
AMSRC-TR-79-22 ..... N79-32329 #

AMRL-TR-78-7 ..... N79-32826 #
AMRL-TR-79-34 ..... N79-32842 #

ANL/CES/TE-78-9 ..... N79-32711 #
ANL/EES/TM-23 ..... N79-32699*#
ANL/ES-65 ..... N79-32745 #
ANL/ES-74 ..... N79-32620 #
ANL/FPP/TM-118 ..... N79-32482 #
ANL/OEPM-78-2 ..... N79-32697 #
ANL/RER-79-2 ..... N79-32750 #

APL/JHU/EQR-78/4 ..... N79-32739 #
APL/JHU/TG-1323 ..... N79-32188 #

AR-2 ..... N79-32617 #
AR-4 ..... N79-32741 #
AR-001-309 ..... N79-32527 #
AR-001-656 ..... N79-32160 #

ARB-R-A6-207-30-78-96 ..... N79-32259 #

ARC-R/M-3820 ..... N79-32178 #
ARC-R/M-3827 ..... N79-32179 #

ARI-TR-78-P6 ..... N79-32966 #
ARI-TR-78-TH7 ..... N79-32614 #

ARL-MECH-ENG-NOTE-373 ..... N79-32527 #

ARL-TM-79-3 ..... N79-32970 #

ARL-TR-79-2 ..... N79-32973 #

ARLCD-TR-79016 ..... N79-33079 #

ARO-10298.9-EL ..... N79-33080 #
ARO-11041.13-P ..... N79-32986 #
ARO-11054.1-GS ..... N79-32771 #
ARO-12937.1-E ..... N79-32974 #
ARO-12988.2-EL ..... N79-33080 #
ARO-13428.1-P ..... N79-32306 #
ARO-13469.4-P ..... N79-32986 #
ARO-13599.6-MI ..... N79-32514 #
ARO-14057.3-MS ..... N79-32328 #
ARO-14066.4-EL ..... N79-32442*#
ARO-14273.15-EL ..... N79-33080 #
ARO-14966.2-AE ..... N79-32168 #

ASC-R-118 ..... N79-32251 #

AVRADCOM-TR-79-20 ..... N79-32552*#

AWS/TR-79/001 ..... N79-32806 #

BBC-RD-1979/12 ..... N79-32403
BBC-RD-1979/13 ..... N79-32404
BBC-RD-1979/14 ..... N79-32523
BBC-RD-1979/15 ..... N79-32524

BBN-4124 ..... N79-32430 #

BDX-613-2138-REV ..... N79-32478 #

BETC/IC-79/2 ..... N79-32621 #
BETC/PPS-79/2 ..... N79-32381 #

BMFT-FB-T-78-20 ..... N79-32483 #
BMFT-FB-T-78-21 ..... N79-32484 #
BMFT-FB-T-78-25 ..... N79-32393 #
BMFT-FB-T-78-28 ..... N79-32751 #
BMFT-FB-T-78-29 ..... N79-32394 #
BMFT-FB-T-78-30 ..... N79-32779 #
BMFT-FB-T-78-31 ..... N79-33151 #
BMFT-FB-T-78-33 ..... N79-32730 #
BMFT-FB-T-78-34 ..... N79-32282 #
BMFT-FB-T-78-35 ..... N79-32732 #
BMFT-FB-T-78-37 ..... N79-32485 #
BMFT-FB-T-78-38 ..... N79-32531 #
BMFT-FB-T-78-39 ..... N79-33025 #
BMFT-FB-T-78-40 ..... N79-32486 #
BMFT-FB-T-78-41 ..... N79-32535 #
BMFT-FB-T-78-54 ..... N79-32488 #
BMFT-FB-T-78-55 ..... N79-32448 #

BMFT-FB-W-77-24 ..... N79-32244 #
BMFT-FB-W-78-18 ..... N79-32245 #
BMFT-FB-W-78-26 ..... N79-32253 #
BMFT-FB-W-78-27 ..... N79-32445 #
BMFT-FB-W-78-28 ..... N79-33132 #
BMFT-FB-W-78-32 ..... N79-32532 #
BMFT-FB-W-78-33 ..... N79-33145 #
BMFT-FB-W-78-34 ..... N79-32246 #
BMFT-FB-W-78-35 ..... N79-32247 #

BMVG-FBWT-78-14 ..... N79-33006 #
BMVG-FBWT-78-17 ..... N79-32556 #

BNL-25812 ..... N79-32367 #
BNL-25928 ..... N79-32704 #
BNL-25933 ..... N79-32722 #
BNL-25935 ..... N79-32718 #
BNL-26047 ..... N79-32387 #
BNL-26130 ..... N79-32388 #

BNWL-SA-6503 ..... N79-32828 #

BR-79-01 ..... N79-32505 #

BR64334 ..... N79-32534 #
BR65880 ..... N79-32600 #
BR66981 ..... N79-32194 #
BR67330 ..... N79-32182 #
BR67351 ..... N79-32195 #
BR67755 ..... N79-32179 #
BR67756 ..... N79-32178 #

CALSPAN-BA-5103-M-101 ..... N79-32222 #

CALSPAN-6275-A-1 ..... N79-32172 #

CATHEC/27 ..... N79-33096 #

CCR-1-78 ..... N79-32574*#

CD.6500636 ..... N79-32487 #

CED-78-148C-APP-1 ..... N79-32742 #

CEL-TN-1550 ..... N79-32334 #

CIRC-787 ..... N79-32613 #

CISR-TR-8 ..... N79-32859 #

CNES-NT-89 ..... N79-32520 #

COM-73-11713 ..... N79-32547 #
COM-74-10854 ..... N79-32292 #

CONF-771036-17 ..... N79-32828 #
CONF-780253-1 ..... N79-32719 #
CONF-780515-2 ..... N79-33056 #
CONF-780541-1 ..... N79-32827 #
CONF-780611-8 ..... N79-32391 #
CONF-780636-11 ..... N79-32748 #
CONF-780655-1 ..... N79-32341 #
CONF-780706-1 ..... N79-32378 #
CONF-780706-13 ..... N79-32392 #
CONF-780712-7 ..... N79-32517 #
CONF-780737-1 ..... N79-32373 #
CONF-780801-4 ..... N79-32820 #
CONF-780801-22 ..... N79-32720 #
CONF-780808-27 ..... N79-32708 #
CONF-780813-11 ..... N79-32376 #
CONF-780814-3 ..... N79-32190 #
CONF-780894-SUMM ..... N79-32689 #
CONF-780902-9 ..... N79-32366 #
CONF-781033-45 ..... N79-32994 #
CONF-781121-22 ..... N79-33093 #
CONF-781228-1 ..... N79-32683 #
CONF-781244-1 ..... N79-32725 #
CONF-781247 ..... N79-33053 #
CONF-781247-1 ..... N79-33058 #
CONF-790118-3 ..... N79-32776 #
CONF-790119-2 ..... N79-32684 #
CONF-790125-56 ..... N79-32367 #
CONF-790213-5 ..... N79-32383 #
CONF-790224-1 ..... N79-32706 #
CONF-790301-10 ..... N79-32387 #
CONF-790305-5 ..... N79-32700 #
CONF-790327-147 ..... N79-32545 #
CONF-790328-2 ..... N79-32680 #
CONF-790328-3 ..... N79-32705 #
CONF-790348 ..... N79-33002 #
CONF-790353-2 ..... N79-32702 #
CONF-790413-3 ..... N79-32698 #
CONF-790430-7 ..... N79-32530 #
CONF-790442-8 ..... N79-32342 #
CONF-790442-11 ..... N79-33055 #
CONF-790483-2 ..... N79-32726 #
CONF-790486-2 ..... N79-32704 #
CONF-790487-1 ..... N79-32718 #
CONF-790488-3 ..... N79-33103 #
CONF-790455-1 ..... N79-32998 #
CONF-790466-1 ..... N79-33005 #
CONF-790505-10 ..... N79-32703 #
CONF-790506-1 ..... N79-32480 #
CONF-790517-1 ..... N79-32710 #
CONF-790524-4 ..... N79-32989 #
CONF-790540-4 ..... N79-33097 #
CONF-790541 ..... N79-32712 #
CONF-790581-4 ..... N79-32714 #
CONF-790581-6 ..... N79-32716 #
CONF-790615-9 ..... N79-32690 #
CONF-790615-10 ..... N79-32678 #
CONF-790615-12 ..... N79-32679 #
CONF-790803-26 ..... N79-32388 #
CONF-7805125-1 ..... N79-32377 #
CONF-7806114 ..... N79-33049 #
CONF-7808101-1 ..... N79-32518 #

COO-2764-002 ..... N79-32713 #
COO-2874-41 ..... N79-32749 #
COO-3071-239 ..... N79-32994 #
COO-4051-25 ..... N79-32685 #
COO-4051-35 ..... N79-33096 #
COO-4051-41 ..... N79-32686 #
COO-4094-32 ..... N79-32700 #
COO-4094-34 ..... N79-32702 #
COO-4393-03 ..... N79-33057 #
COO-4523-1 ..... N79-32682 #
COO-4589-1 ..... N79-32379 #
COO-4691-1 ..... N79-32386 #
COO-4704-2 ..... N79-32705 #

CORADCOM-79-2 ..... N79-32187 #

CRIP-NT-129 ..... N79-32601 #

CRIP-NT-131 ..... N79-32521 #

CSIR-P010-7903-08 ..... N79-32859 #

CTR-MATH-1979-1 ..... N79-32930 #
CTR-MATH-1979-2 ..... N79-32931 #
CTR-MATH-1979-3 ..... N79-32957 #
CTR-MATH-1979-4 ..... N79-32932 #
CTR-MATH-1979-5 ..... N79-32933 #
CTR-MATH-1979-7 ..... N79-32934 #
CTR-MATH-1979-8 ..... N79-32935 #
CTR-MATH-1979-9 ..... N79-32936 #
CTR-MATH-1979-11 ..... N79-32937 #

CTR-79.01-R ..... N79-32929 #

CU-SL-79-02-ONR ..... N79-32947 #

C76-1555/501 ..... N79-32538*#
C77-239/034A ..... N79-33017 #

D-133 ..... N79-32640*#
D-180-25309-1 ..... N79-32202 #

DAI-DF-7763-001-TR ..... N79-32564 #

DCN-R-21-01 ..... N79-32554 #

DHEW/PUB/PHS-79/3210 ..... N79-32413 #

DLR-MITT-78-02 ..... N79-32243 #

DR-28 ..... N79-32790 #

DRI-GEOPHYS-PAPERS-R-53 ..... N79-32785 #

DOC-79SDS030 ..... N79-33101 #

DOE/EDP-0046 ..... N79-32746 #
DOE/EIA-0102/13 ..... N79-32619 #
DOE/EIA-0102/53 ..... N79-32372 #
DOE/EIA-0103/31 ..... N79-32618 #
DOE/EIA-0135 ..... N79-32723 #
DOE/ET-0087 ..... N79-32696 #
DOE/JPL-1012-7 ..... N79-32633*#
DOE/JPL-1060-16 ..... N79-32632*#
DOE/JPL-1060-24 ..... N79-32634*#
DOE/TIC-4068-T2-APP-A ..... N79-32443 #
DOE/TIC-10107 ..... N79-32617 #
DOE/TIC-10128 ..... N79-32390 #

DOT-P-50-79-03 ..... N79-32184 #

DOT-TSC-RSPA-79-3 ..... N79-32196 #
DOT-TSC-RSPA-79-5 ..... N79-33107 #

DOT-TSC-UMTA-77-49-2 ..... N79-33109 #
DOT-TSC-UMTA-77-49-5 ..... N79-33110 #
DOT-TSC-UMTA-79-11 ..... N79-32456 #

DRDNI-T-79-33 ..... N79-32207 #

DRDNI-TR-RR-7T-2 ..... N79-33014 #

DTNSRDC-79/063 ..... N79-32327 #

DTNSRDC/SHE-79-31 ..... N79-32333 #

D6-44456-VOL-1 ..... N79-32164*#
D6-44458-VOL-1 ..... N79-32163*#
D6-44467-VOL-2 ..... N79-32162*#
D6-44468-VOL-1 ..... N79-32161*#
D180-25240-1 ..... N79-32441 #
D180-25330-1 ..... N79-32200 #

E-9934 ..... N79-32467*#
E-9944 ..... N79-32359*#
E-9992 ..... N79-32552*#

ECON-DR-997 ..... N79-32809 #

ECR-85 ..... N79-32566 #

EGG-1183-1634 ..... N79-32777 #

EPA-450/3-78-120 ..... N79-32755 #
EPA-600/2-79-046 ..... N79-32756 #
EPA-901/9-79-007 ..... N79-32754 #

EPRI-ER-808-SY ..... N79-32687 #
EPRI-ER-1045 ..... N79-33004 #

ERADCOM/ASL-TR-0028 ..... N79-32808 #

ERIM-130300-15-F ..... N79-32428 #
ERIM-134400-7-T ..... N79-32615 #

ERL-0046-TR ..... N79-32773 #
ERL-0049-TR ..... N79-32421 #
ERL-0050-TM ..... N79-32858 #
ERL-0053-TR ..... N79-32581 #

ESA-CR(P)-1190 ..... N79-32487 #
ESA-CR(P)-1201 ..... N79-32447 #

ESA-STR-211 ..... N79-32729 #

ESA-STR-203 ..... N79-33144 #

ESD-TR-78-294 ..... N79-33091 #
ESD-TR-78-398 ..... N79-32438 #
ESD-TR-79-27 ..... N79-33013 #
ESD-TR-79-37 ..... N79-32425 #
ESD-TR-79-44 ..... N79-32426 #
ESD-TR-79-75 ..... N79-32772 #
ESD-TR-79-121 ..... N79-33015 #

ESL-710929-5 ..... N79-32431 #

EST-43-1 ..... N79-32772 #

EWG-LS-0377.10.0 ..... N79-33111 #

E79-10264 ..... N79-32603*#
E79-10269 ..... N79-32604*#
E79-10271 ..... N79-32605*#
E79-10280 ..... N79-32606*#
E79-10282 ..... N79-32607*#
E79-10283 ..... N79-32608*#
E79-10285 ..... N79-32609*#
E79-10286 ..... N79-32610*#
E79-10287 ..... N79-32611*#

FAA-NA-79-15 ..... N79-32414 #
FAA-NA-79-17-PT-1 ..... N79-32416 #
FAA-NA-79-18-PT-2 ..... N79-32415 #
FAA-NA-79-180 ..... N79-32418 #

FAA-RD-78-58 ..... N79-32218 #
FAA-RD-79-11 ..... N79-32418 #
FAA-RD-79-58 ..... N79-32417 #
FAA-RD-79-59 ..... N79-32198 #
FAA-RD-79-63 ..... N79-32805 #
FAA-RD-79-66 ..... N79-32969 #

FCC/DF-77/002A ..... N79-32458 #
FCC/DF-79/003A ..... N79-32458 #

FE-1775-19 ..... N79-32591 #
FE-2240-96 ..... N79-32382 #
FE-2445-1-VOL-1 ..... N79-32747 #
FE-2489-31 ..... N79-32380 #

FFA-TN-HU-1993 ..... N79-32348 #

FFDL-TR-78-8 ..... N79-32183 #
FFDL-TR-79-3019 ..... N79-32363 #

FHWA/RD-79/S0855 ..... N79-32402 #

FOA-C-20295-E4 ..... N79-32782 #
FOA-C-20303-D9 ..... N79-33063 #
FOA-C-20306-F9 ..... N79-32286 #
FOA-C-30164-E1 ..... N79-33026 #
FOA-C-55031-H6 ..... N79-32836 #

FR-11409 ..... N79-32326*#
FR-11852 ..... N79-32324*#

FR79-76-943R ..... N79-32266*#

FSU-STATISTICS-M488 ..... N79-32954 #

H-1104 ..... N79-32151*#

HAC-REP-E3256-VOL-1 ..... N79-32638*#
HAC-REP-E3256-VOL-2 ..... N79-32639*#

HAC-REP-1954 ..... N79-32266*#

HCP/M2522-01 ..... N79-32715 #

HDL-TR-1887 ..... N79-32427 #
HDL-TR-1978 ..... N79-32542 #

IIT-B/CE-79-1 ..... N79-32576 #

IPF-77-3 ..... N79-33060 #
IPF-77-4 ..... N79-33061 #

IPPJ-392 ..... N79-33027 #
IPPJ-404 ..... N79-33028 #
IPPJ-405 ..... N79-33029 #
IPPJ-406 ..... N79-33031 #
IPPJ-407 ..... N79-33030 #
IPPJ-408 ..... N79-33032 #
IPPJ-409 ..... N79-33033 #
IPPJ-410 ..... N79-33034 #

IR-1 ..... N79-32288 #
IR-8 ..... N79-32591 #

IRT-8164-003 ..... N79-32985 #

IS-T-850 ..... N79-33092 #

ISBN-0-11-471153-4 ..... N79-32178 #
ISBN-0-11-471160-7 ..... N79-32179 #
ISBN-87-7478-135-9 ..... N79-32786 #
ISBN-87-7478-136-7 ..... N79-32787 #
ISBN-87-7478-137-5 ..... N79-32788 #
ISBN-87-7478-156-1 ..... N79-32813 #
ISBN-87-7478-158-8 ..... N79-32785 #
ISBN-87-7478-161-8 ..... N79-32789 #
ISBN-951-751-299-6 ..... N79-32343 #

ISD-240 ..... N79-32593 #

ISSN-0077-5606 ..... N79-32304 #
ISSN-0077-5606 ..... N79-32305 #

IZF-1978-8 ..... N79-32839 #
IZF-1978-19 ..... N79-32450 #
IZF-1978-19 ..... N79-32975 #
IZF-1978-21 ..... N79-32843 #
IZF-1978-22 ..... N79-32976 #
IZF-1978-23 ..... N79-32829 #
IZF-1978-25 ..... N79-32837 #
IZF-1979-1 ..... N79-32451 #
IZF-1979-6 ..... N79-32838 #

JPL-PUB-77-24-REV-1 ..... N79-32875*#
JPL-PUB-78-15-VOL-8 ..... N79-32630*#
JPL-PUB-78-15-VOL-9 ..... N79-32631*#
JPL-PUB-79-21 ..... N79-32632*#
JPL-PUB-79-26 ..... N79-32633*#
JPL-PUB-79-48 ..... N79-32822*#
JPL-PUB-79-60 ..... N79-33138*#
JPL-PUB-79-61 ..... N79-32634*#
JPL-PUB-79-64 ..... N79-32369*#
JPL-PUB-79-66 ..... N79-32635*#
JPL-PUB-79-69-REV-1 ..... N79-32409*#
JPL-PUB-79-74 ..... N79-33139*#
JPL-PUB-79-77 ..... N79-32156*#
JPL-PUB-79-78 ..... N79-32410*#
JPL-PUB-79-84 ..... N79-32411*#
JPL-PUB-79-85 ..... N79-33140*#
JPL-PUB-79-86 ..... N79-32636*#
JPL-PUB-79-93 ..... N79-32412*#

JSC-14910 ..... N79-32605*#

JWTR-4 ..... N79-32330 #

K/OA-4445 ..... N79-32504 #

KRI-9232-VI ..... N79-33108 #

L-12704 ..... N79-32277*#
L-12775 ..... N79-32500*#
L-12977 ..... N79-32743*#
L-12978 ..... N79-32744*#

LA-UR-78-427 ..... N79-32706 #
LA-UR-78-2279 ..... N79-32377 #
LA-UR-78-2412 ..... N79-32998 #

LA-UR-79-332 ..... N79-32518 #
LA-UR-79-670 ..... N79-32690 #
LA-UR-79-673 ..... N79-32698 #
LA-UR-79-679 ..... N79-32678 #
LA-UR-79-683 ..... N79-32679 #
LA-UR-79-938 ..... N79-32565 #
LA-UR-79-1029 ..... N79-32530 #
LA-UR-79-1064 ..... N79-33058 #
LA-UR-79-1236 ..... N79-32989 #
LA-UR-79-1335 ..... N79-32716 #
LA-UR-79-1369 ..... N79-32714 #

LA-7376-MS ..... N79-32728 #
LA-7465-MS ..... N79-32477 #
LA-7602-MS ..... N79-32991 #
LA-7616-PR ..... N79-32996 #
LA-7635-MS ..... N79-32481 #
LA-7798-MS ..... N79-33050 #
LA-7808-MS ..... N79-32988 #

LBL-8007 ..... N79-32312 #
LBL-8208 ..... N79-32987 #
LBL-8412 ..... N79-32545 #
LBL-8778 ..... N79-32776 #
LBL-8802 ..... N79-32684 #
LBL-9017 ..... N79-33003 #

LCBS-30 ..... N79-32625 #

LCD-79-409 ..... N79-32154 #

LEC-11021-REV-B ..... N79-32605*#
LEC-13390 ..... N79-32605*#

LETC/TPR-78/1 ..... N79-32375 #

LHNCBC-79-09 ..... N79-32455 #
LHNCBC-79-12 ..... N79-32459 #

LMSC-D626523 ..... N79-32701 #

LUIP-7906 ..... N79-33149 #

LTC-79-25 ..... N79-32551*#

MAP-1436 ..... N79-32325*#

MAN-1037 ..... N79-32969 #

METC/MI-79/3 ..... N79-32311 #

MFC-TSR-1956 ..... N79-32948 #

MIMEO-SER-1225 ..... N79-32900 #

MIRADCOM-78-0070-022 ..... N79-33020 #

MIT/LCS/TR-215 ..... N79-32879 #

MLM-2606(OP) ..... N79-32680 #

MRL-TR-79-16C ..... N79-32507 #

MPI-PAE/EXTRATERR-146 ..... N79-33024 #
MPI-PAE/EXTRATERR-146 ..... N79-33123 #
MPI-PAE/EXTRATERR-147 ..... N79-33148 #

MRC-TSR-1935 ..... N79-32856 #
MRC-TSR-1936 ..... N79-32920 #
MRC-TSR-1937 ..... N79-32913 #
MRC-TSR-1938 ..... N79-32909 #
MRC-TSR-1939 ..... N79-32919 #
MRC-TSR-1940 ..... N79-32587 #
MRC-TSR-1943 ..... N79-32918 #
MRC-TSR-1944 ..... N79-32908 #
MRC-TSR-1945 ..... N79-32959 #
MRC-TSR-1946 ..... N79-32921 #
MRC-TSR-1948 ..... N79-32583 #
MRC-TSR-1949 ..... N79-32960 #
MRC-TSR-1950 ..... N79-32961 #
MRC-TSR-1952 ..... N79-32922 #
MRC-TSR-1954 ..... N79-32945 #
MRC-TSR-1955 ..... N79-32951 #
MRC-TSR-1957 ..... N79-32923 #
MRC-TSR-1958-PT-1 ..... N79-32910 #
MRC-TSR-1959 ..... N79-32854 #

MTR-37 ..... N79-33015 #
MTR-79W00033 ..... N79-32459 #

MTR-7581 ..... N79-32413 #

N-94 ..... N79-32955 #

NAMRL-1259 ..... N79-32831 #

NASA-CASE-GSC-12319-1 ..... N79-32852*#
NASA-CASE-GSC-12513-1 ..... N79-32217*#

NASA-CASE-LEW-13282-1 ..... N79-32463*#

NASA-CASE-MFO-14641-1 ..... N79-32408*#

NASA-CP-2097 ..... N79-32640*#
NASA-CP-2100 ..... N79-32797*#

NASA-CR-2847 ..... N79-32164*#
NASA-CR-2849 ..... N79-32163*#
NASA-CR-2858 ..... N79-32162*#
NASA-CR-2859 ..... N79-32161*#
NASA-CR-3175 ..... N79-32540*#
NASA-CR-144886 ..... N79-32197*#
NASA-CR-150318 ..... N79-32628*#
NASA-CR-150319 ..... N79-32468*#
NASA-CR-150321 ..... N79-32465*#
NASA-CR-152241 ..... N79-32219*#
NASA-CR-158886 ..... N79-32699*#
NASA-CR-159125 ..... N79-32157*#
NASA-CR-159137 ..... N79-32574*#
NASA-CR-159622 ..... N79-32551*#
NASA-CR-159630 ..... N79-32538*#
NASA-CR-159637 ..... N79-32326*#
NASA-CR-159642 ..... N79-32303*#
NASA-CR-159647 ..... N79-32211*#
NASA-CR-159679 ..... N79-32212*#
NASA-CR-160293 ..... N79-32605*#
NASA-CR-161296 ..... N79-32324*#
NASA-CR-161299 ..... N79-32325*#
NASA-CR-161300 ..... N79-32526*#
NASA-CR-161301 ..... N79-32213*#
NASA-CR-161302 ..... N79-32266*#
NASA-CR-162091 ..... N79-32604*#
NASA-CR-162098 ..... N79-32603*#
NASA-CR-162125 ..... N79-32940*#
NASA-CR-162145 ..... N79-32606*#
NASA-CR-162147 ..... N79-32607*#
NASA-CR-162271 ..... N79-32609*#
NASA-CR-162273 ..... N79-32610*#
NASA-CR-162274 ..... N79-32611*#
NASA-CR-162289 ..... N79-32631*#
NASA-CR-162290 ..... N79-32630*#
NASA-CR-162291 ..... N79-32875*#
NASA-CR-162292 ..... N79-33138*#
NASA-CR-162293 ..... N79-32822*#
NASA-CR-162294 ..... N79-32410*#
NASA-CR-162295 ..... N79-32612*#
NASA-CR-162296 ..... N79-32369*#
NASA-CR-162297 ..... N79-32409*#
NASA-CR-162298 ..... N79-32635*#
NASA-CR-162299 ..... N79-32156*#
NASA-CR-162300 ..... N79-33140*#
NASA-CR-162301 ..... N79-32633*#
NASA-CR-162302 ..... N79-32632*#
NASA-CR-162303 ..... N79-32634*#
NASA-CR-162304 ..... N79-32636*#
NASA-CR-162305 ..... N79-32611*#
NASA-CR-162306 ..... N79-33139*#
NASA-CR-162307 ..... N79-32907*#
NASA-CR-162309 ..... N79-32499*#
NASA-CR-162312 ..... N79-32210*#
NASA-CR-162314 ..... N79-33035*#
NASA-CR-162315 ..... N79-32442*#
NASA-CR-162316 ..... N79-32575*#
NASA-CR-162317 ..... N79-32876*#
NASA-CR-162318 ..... N79-33141*#
NASA-CR-162319 ..... N79-33122*#
NASA-CR-162320 ..... N79-32539*#
NASA-CR-162321 ..... N79-33121*#
NASA-CR-162322 ..... N79-32877*#
NASA-CR-162323 ..... N79-32906*#
NASA-CR-162328 ..... N79-32638*#

NASA-SP-428 ..... N79-32225*#
NASA-SP-7037(112) N79-32150*

NASA-TM-72868 ..... N79-32151*#
NASA-TM-78133 ..... N79-32612*#
NASA-TM-78594 ..... N79-32265*#
NASA-TM-78601 ..... N79-32185*#

NASA-TM-78611 ..... N79-32205*#
NASA-TM-78619 ..... N79-32152*#
NASA-TM-80123 ..... N79-32159*#
NASA-TM-80140 ..... N79-32466*#
NASA-TM-80142 ..... N79-32158*#
NASA-TM-80155 ..... N79-32637*#
NASA-TM-80160 ..... N79-32358*#
NASA-TM-80161 ..... N79-32498*#
NASA-TM-80511 ..... N79-32608*#

NASA-TP-1478 ..... N79-32743*#
NASA-TP-1479 ..... N79-32744*#
NASA-TP-1496 ..... N79-32277*#
NASA-TP-1506 ..... N79-32500*#
NASA-TP-1527 ..... N79-32467*#
NASA-TP-1542 ..... N79-32552*#
NASA-TP-1544 ..... N79-32359*#
NASA-TP-1548 ..... N79-32796*#

NATC-TM-78-2-CS ..... N79-32915 #

NBSIR-79-1709 ..... N79-32738 #
NBSIR-79-1723 ..... N79-32474 #

NLR-MP-77013-U ..... N79-32834 #
NLR-MP-77023-U ..... N79-32344 #
NLR-MP-77024-U ..... N79-32345 #
NLR-MP-77028-U ..... N79-32191 #
NLR-MP-78007-U ..... N79-32861 #
NLR-MP-78008-U ..... N79-32595 #
NLR-MP-78015-U ..... N79-32596 #
NLR-MP-78016-U ..... N79-32180 #
NLR-MP-78018-U ..... N79-32346 #
NLR-MP-78019-U ..... N79-32214 #
NLR-MP-78020-U ..... N79-32835 #
NLR-MP-78022-U ..... N79-32597 #
NLR-MP-78024-U ..... N79-32347 #
NLR-MP-78027-U ..... N79-32283 #
NLR-MP-78030-U ..... N79-32193 #
NLR-MP-78031-U ..... N79-32623 #
NLR-MP-78032-U ..... N79-32204 #
NLR-MP-78033-U ..... N79-32519 #

NLR-TR-76035-U ..... N79-32280 #
NLR-TR-76134-U ..... N79-32255 #
NLR-TR-77009-U ..... N79-32175 #
NLR-TR-77039-U ..... N79-32281 #
NLR-TR-77062-U ..... N79-32594 #
NLR-TR-77066-U ..... N79-32176 #
NLR-TR-77078-U ..... N79-32192 #
NLR-TR-77081-U ..... N79-32177 #
NLR-TR-77103-U ..... N79-32350 #
NLR-TR-77113-U ..... N79-32284 #
NLR-TR-77115-U ..... N79-32287 #
NLR-TR-77122-U ..... N79-32288 #
NLR-TR-77124-U ..... N79-32351 #
NLR-TR-78008-U ..... N79-32289 #
NLR-TR-78016-U ..... N79-32926 #
NLR-TR-78025-U ..... N79-32290 #
NLR-TR-78050-U ..... N79-32291 #
NLR-TR-78073-U ..... N79-32216 #
NLR-TR-78078-U ..... N79-32260 #
NLR-TR-78080-U ..... N79-32522 #
NLR-TR-78081-U ..... N79-32285 #
NLR-TR-78082-U-PT-2 ..... N79-32261 #
NLR-TR-78135-U ..... N79-32181 #

NNEI-23/SA ..... N79-32736 #

NOAA-DR-ERL-SEL-2 ..... N79-32793 #

NOAA-M-NOS-NGS-1 ..... N79-32792 #

NOAA-S/T-77-2838 ..... N79-32741 #

NOAA-TM-EDIS-25 ..... N79-32753 #

NOAA-TM-ERL-RFC-2 ..... N79-32208 #

NOAA-TM-NWS-NHC-12 ..... N79-32814 #

NOAA-TR-ERL-404 ..... N79-32821 #
NOAA-TR-ERL-405 ..... N79-32489 #

NOAA-TR-NWS-21 ..... N79-32815 #

NOAA-79031303 ..... N79-32793 #
NOAA-79041204 ..... N79-32208 #
NOAA-79043001 ..... N79-32792 #
NOAA-79043005 ..... N79-32489 #
NOAA-79051104 ..... N79-32814 #
NOAA-79051506 ..... N79-32815 #
NOAA-79051603 ..... N79-32821 #
NOAA-79052101 ..... N79-32753 #

NOSC/TR-396 ..... N79-32857 #

NPL-AC-90 ..... N79-32452 #

NPL-CHEM-97 ..... N79-32349 #
NPL-CHEM-98 ..... N79-32316 #

NPL-COM-107 ..... N79-32446 #

NPL-CSU-3/79 ..... N79-32884 #

NPL-DES-51 ..... N79-32860 #
NPL-DES-53 ..... N79-33062 #

NPL-DNACS-14/79 ..... N79-32927 #
NPL-DNACS-15/79 ..... N79-32885 #
NPL-DNACS-17/79 ..... N79-32928 #
NPL-DNACS-18/79 ..... N79-32862 #

NPL-MOM-33 ..... N79-32557 #
NPL-MOM-34 ..... N79-32533 #

NPL-MP-78014-U ..... N79-32731 #

NPL-QU-AR-77 ..... N79-32400 #
NPL-QU-AR-78 ..... N79-32401 #

NPL-QU-50 ..... N79-32780 #
NPL-QU-52 ..... N79-32399 #

NPRDC-TR-79-19 ..... N79-32153 #

NPS53-79-002 ..... N79-32914 #
NPS55-79-009 ..... N79-32895 #
NPS63-78-006 ..... N79-32807 #

NRC/CNR-TT-1950 ..... N79-32305 #
NRC/CNR-TT-1951 ..... N79-32304 #

NRL-MR-3964 ..... N79-33037 #
NRL-MR-3965 ..... N79-33047 #
NRL-MR-4000 ..... N79-33048 #
NRL-MR-4017 ..... N79-33045 #
NRL-MR-4018 ..... N79-32508 #
NRL-MR-4022 ..... N79-32503 #
NRL-MR-4025 ..... N79-33038 #
NRL-MR-4029 ..... N79-33046 #

NRL-TR-74173-U ..... N79-32254 #

NRL-8301 ..... N79-32972 #
NRL-5422226 ..... N79-32429 #

NRTC78-46R ..... N79-33044 #

NSF/RA-761743 ..... N79-32737 #
NSF/RA-790023 ..... N79-32215 #
NSF/RANN/AER-75-20501/PR/76/3 ..... N79-32737 #

NSWC/DL-TR-79-86 ..... N79-32971 #
NSWC/WOL/TR-78-211 ..... N79-32439 #
NSWC/WOL/TR-78-213 ..... N79-32676 #
NSWC/WOL/TR-79-119 ..... N79-32371 #

NTIA/REPT-79/16 ..... N79-32453 #
NTIA/REPT-79/18 ..... N79-32457 #

NTIS/PS-75/250 ..... N79-32454 #
NTIS/PS-75/399 ..... N79-32547 #
NTIS/PS-75/414 ..... N79-32292 #
NTIS/PS-76/0362 ..... N79-32454 #
NTIS/PS-76/0383 ..... N79-32547 #
NTIS/PS-76/0398 ..... N79-32830 #
NTIS/PS-76/0420 ..... N79-32292 #
NTIS/PS-77/0364 ..... N79-32292 #
NTIS/PS-77/0419 ..... N79-32830 #
NTIS/PS-77/0435 ..... N79-32547 #
NTIS/PS-78/0357 ..... N79-32292 #
NTIS/PS-78/0516 ..... N79-32547 #
NTIS/PS-78/0517 ..... N79-32830 #
NTIS/PS-78/0525 ..... N79-32454 #
NTIS/PS-79/0476/6 ..... N79-32292 #
NTIS/PS-79/0514/4 ..... N79-32547 #

NTIS/PS-79/0525/0 ..... N79-32454 #
NTIS/PS-79/0533/4 ..... N79-32830 #

NUREG-CR-0132 ..... N79-32590 #

NVO-196-9 ..... N79-32997 #
NVO-1555-4 ..... N79-32546 #

NWC-TP-6109 ..... N79-32528 #

NYSERDA-78/6-VOL-1 ..... N79-32734 #

N101 ..... N79-32949 #
N103 ..... N79-32956 #

OC-E-79-0002AA-1 ..... N79-32953 #

ONERA-NT-1978-1 ..... N79-32968 #
ONERA-NT-1978-4 ..... N79-32314 #
ONERA-NT-1978-6 ..... N79-32224 #
ONERA-NT-1978-7 ..... N79-32315 #
ONERA-NT-1978-8 ..... N79-32883 #

OR-14027-VOL-1 ..... N79-32250 #

ORNL/NUREG-18/V2 ..... N79-32590 #
ORNL/OEPA-12 ..... N79-32724 #
ORNL/SUB-7303/1 ..... N79-32629 #
ORNL/SUB-7390/1 ..... N79-32707 #
ORNL/TM-5804 ..... N79-32555 #
ORNL/TM-5848 ..... N79-32515 #
ORNL/TM-6248 ..... N79-32812 #
ORNL/TM-6478 ..... N79-32592 #
ORNL/TM-6597 ..... N79-33102 #
ORNL/TM-6703 ..... N79-33052 #
ORNL/TM-6824 ..... N79-33054 #
ORNL/TM-6913 ..... N79-32677 #
ORNL/TM-4573 ..... N79-32529 #

ORP/TAD-78-2 ..... N79-33010 #

OSURF-760222/784098-17 ..... N79-32308 #
OSURF-760518/784556 ..... N79-32897 #

OU-AENE-79-7 ..... N79-32278 #

OUEL-1270/78 ..... N79-32752 #
OUEL-1282/79 ..... N79-32598 #

PAPER-78-30.5 ..... N79-32748 #

PB-294327/2 ..... N79-32793 #
PB-294405/6 ..... N79-32459 #
PB-294614/3 ..... N79-32196 #
PB-294692/9 ..... N79-32458 #
PB-294819/8 ..... N79-32453 #
PB-294926/1 ..... N79-32738 #
PB-294960/0 ..... N79-32457 #
PB-294965/9 ..... N79-32455 #
PB-294967/5 ..... N79-33114 #
PB-294972/5 ..... N79-33113 #
PB-294975/8 ..... N79-32755 #
PB-294981/6 ..... N79-32756 #
PB-294983/2 ..... N79-32754 #
PB-294989/9 ..... N79-33112 #
PB-295038/4 ..... N79-33011 #
PB-295043/4 ..... N79-32456 #
PB-295190/3 ..... N79-32184 #
PB-295214/1 ..... N79-33010 #
PB-295320/6 ..... N79-32154 #
PB-295349/5 ..... N79-33111 #
PB-295439/4 ..... N79-32739 #
PB-295476/6 ..... N79-33109 #
PB-295479/0 ..... N79-33110 #
PB-295569/8 ..... N79-32626 #
PB-295612/6 ..... N79-32625 #
PB-295698/5 ..... N79-32208 #
PB-295782/7 ..... N79-32734 #
PB-295814/8 ..... N79-32395 #
PB-295876/7 ..... N79-32735 #
PB-295888/2 ..... N79-32737 #
PB-295892/4 ..... N79-32215 #
PB-296066/8 ..... N79-32736 #
PB-296076/3 ..... N79-32259 #
PB-296131/6 ..... N79-32489 #
PB-296263/7 ..... N79-33108 #
PB-296275/1 ..... N79-33146 #
PB-296337/9 ..... N79-32402 #
PB-296382/9 ..... N79-33107 #

PB-296351/0 ..... N79-33105 #
PB-296353/6 ..... N79-32624 #
PB-296427/8 ..... N79-32792 #
PB-296914/5 ..... N79-32821 #
PB-296999/6 ..... N79-33098 #
PB-297189/3 ..... N79-32753 #
PB-297190/1 ..... N79-32814 #
PB-297192/7 ..... N79-32815 #

PBEL-31 ..... N79-32821 #

PNL-2693 ..... N79-32692 #
PNL-2941 ..... N79-32995 #
PNL-2969 ..... N79-32709 #

POLY-EE-79-053 ..... N79-33043 #

POLY-M/AE-79-19 ..... N79-32974 #

PPG-411 ..... N79-33041 #

PR-2-13/P5 ..... N79-32611*#
PR-408 ..... N79-33128 #
PR-417 ..... N79-33142 #
PR-439 ..... N79-33143 #
PR-440 ..... N79-32781 #

PREL-79-CR-20 ..... N79-33089 #

PSAD-79-63 ..... N79-33098 #

PUB-3001 ..... N79-32397 #

PWA-FR-11012 ..... N79-32553 #

PWA-5626-12 ..... N79-32211*#

QPR-10 ..... N79-32472 #
QPR-16 ..... N79-32430 #

QR-6 ..... N79-33021 #
QR-7 ..... N79-33021 #

QRDSR-3 ..... N79-33019 #

R-826 ..... N79-32855 #

R/D-114 ..... N79-32591 #

RADC-TR-79-6 ..... N79-32422 #
RADC-TR-79-10 ..... N79-32424 #
RADC-TR-79-15 ..... N79-32428 #
RADC-TR-79-34 ..... N79-32434 #
RADC-TR-79-85 ..... N79-32476 #
RADC-TR-79-86 ..... N79-33085 #
RADC-TR-79-121 ..... N79-32559 #

RAE-TR-IT-171 ..... N79-32534 #

RAE-TR-78114 ..... N79-32600 #
RAE-TR-78124 ..... N79-32194 #
RAE-TR-78148 ..... N79-32195 #
RAE-TR-78151 ..... N79-32182 #

RDA-TR-108600-001 ..... N79-32544 #

REPT-3 ..... N79-32878 #
REPT-3 ..... N79-32896 #
REPT-4 ..... N79-32563 #
REPT-32 ..... N79-32823 #
REPT-78 ..... N79-33057 #
REPT-78-9F7-HETRO-R1 ..... N79-33082 #
REPT-78-113 ..... N79-32213*#
REPT-78/5 ..... N79-33007 #
REPT-79/1 ..... N79-33008 #
REPT-108-F ..... N79-32506 #
REPT-210-1006 ..... N79-32526*#
REPT-278 ..... N79-32769 #
REPT-1326-01-8-1906 ..... N79-32206 #
REPT-1835 ..... N79-32511 #
REPT-014524-9-T ..... N79-32877*#
REPT-014524-10-T ..... N79-32906*#

RHO-BWI-C-41 ..... N79-32616 #

RR-78-1 ..... N79-33114 #
RR-78-6 ..... N79-32950 #

R78-912176-7 ..... N79-32215 #

SAN-0115-T2 ..... N79-32385 #
SAN-0115-T3 ..... N79-32384 #
SAN-1038-PO-1 ..... N79-32717 #
SAN-1265-9 ..... N79-32516 #
SAN-1459-3 ..... N79-32701 #

SAND-77-1441 ..... N79-32[illegible] #
SAND-77-1557 ..... N79-32340 #
SAND-78-0191 ..... N79-32373 #
SAND-78-0264C ..... N79-32378 #
SAND-78-0548C ..... N79-32719 #
SAND-78-0761C ..... N79-32366 #
SAND-78-0778C ..... N79-33056 #
SAND-78-0781C ..... N79-32820 #
SAND-78-0874C ..... N79-32190 #
SAND-78-1077 ..... N79-32775 #
SAND-78-1089C ..... N79-32341 #
SAND-78-1442 ..... N79-32925 #
SAND-78-1620 ..... N79-32811 #
SAND-78-2128C ..... N79-33055 #
SAND-78-7031 ..... N79-32691 #
SAND-78-8221 ..... N79-32694 #
SAND-78-8245 ..... N79-32313 #
SAND-78-8505 ..... N79-32720 #
SAND-78-8628 ..... N79-32392 #
SAND-79-0215C ..... N79-32710 #
SAND-79-0246C ..... N79-32683 #
SAND-79-0396C ..... N79-32480 #
SAND-79-0497C ..... N79-32990 #
SAND-79-0515 ..... N79-32681 #
SAND-79-0600C ..... N79-33005 #
SAND-79-0697C ..... N79-32703 #
SAND-79-0922C ..... N79-32342 #
SAND-79-1120C ..... N79-32712 #

SARRI-EN-TR-78-03 ..... N79-32336 #

SATCOM-79-2 ..... N79-32442*#

SC595.51AR ..... N79-32563 #
SC5123.23FTR ..... N79-32337 #

SEL-136 ..... N79-32877*#
SEL-137 ..... N79-32906*#

SER-B-228-NITT-145 ..... N79-32778 #

SERI/PR-13-154 ..... N79-32688 #
SERI/TP-35-57 ..... N79-32689 #
SERI/TR-33-129 ..... N79-32374 #

SF20 ..... N79-33088 #

SGD-415-PT-1 ..... N79-33146 #

SHE-77-60001 ..... N79-32429 #

SM-78-25 ..... N79-32586 #

SP-1014 ..... N79-32242 #

SR-1 ..... N79-32818 #
SR-22 ..... N79-32769 #

SRD-79-044 ..... N79-32471 #

STAN-CS-79-736 ..... N79-32907*#

STD-UP-002-77-1 ..... N79-33042 #

STDR-79-2 ..... N79-33042 #

STI-TR-1099-3 ..... N79-32198 #

SU-GL-2866 ..... N79-32562 #

SU-IPR-795 ..... N79-33035*#

SU-STAN-CS-79-719 ..... N79-32882 #

SU-SUPRI-TR-9 ..... N79-32516 #

SU-TR-21 ..... N79-32749 #

SU-326-P-30-61 ..... N79-32882 #
SU-326-P-30-65 ..... N79-32942 #

TDCK-71457 ..... N79-32450 #
TDCK-71457 ..... N79-32975 #
TDCK-71624 ..... N79-32843 #
TDCK-71654 ..... N79-32829 #
TDCK-71655 ..... N79-32976 #
TDCK-71718 ..... N79-32451 #
TDCK-71719 ..... N79-32837 #
TDCK-71982 ..... N79-32838 #
TDCK-71983 ..... N79-32839 #

TID-4579-R-10-SUPPL-1 ..... N79-32721 #
TID-29400-2 ..... N79-32389 #

TKK-V-A3(1978) ..... N79-32343 #

TM/ES/79-03 ..... N79-32618 #

TM-1979-4 ..... N79-32426 #
TM-1979-17 ..... N79-33013 #
TM-1979-24 ..... N79-32425 #

TPR-3 ..... N79-32701 #

TR-1 ..... N79-32278 #
TR-1 ..... N79-32328 #
TR-1 ..... N79-32675 #
TR-1-ONR ..... N79-32419 #
TR-9 ..... N79-32331 #
TR-01-002 ..... N79-33036 #
TR-10 ..... N79-32475 #
TR-10 ..... N79-32585 #
TR-11 ..... N79-32361 #
TR-12 ..... N79-33090 #
TR-13 ..... N79-32307 #
TR-13 ..... N79-32362 #
TR-24 ..... N79-32584 #
TR-35 ..... N79-33084 #
TR-64 ..... N79-32912 #
TR-65 ..... N79-32916 #
TR-66 ..... N79-32917 #
TR-78-2 ..... N79-32954 #
TR-79-1 ..... N79-32303*#
TR-79-1-ONR ..... N79-32470 #
TR-79-02 ..... N79-32339 #
TR-177 ..... N79-32824 #
TR-272 ..... N79-32955 #
TR-295 ..... N79-32956 #
TR-305 ..... N79-32949 #
TR-533 ..... N79-33091 #

TRITA-CS-79-02 ..... N79-32886 #

TRITA-EPP-79-01 ..... N79-32449 #
TRITA-EPP-79-03 ..... N79-32783 #
TRITA-EPP-79-05 ..... N79-33009 #
TRITA-EPP-79-07 ..... N79-33133 #
TRITA-EPP-79-08 ..... N79-33134 #
TRITA-EPP-79-09 ..... N79-32784 #

TRITA-NA-79-02 ..... N79-32938 #
TRITA-NA-79-03 ..... N79-32886 #
TRITA-NA-79-04 ..... N79-32939 #
TRITA-NA-79-06 ..... N79-32940*#
TRITA-NA-79-07 ..... N79-32887 #
TRITA-NA-79-08 ..... N79-33104 #
TRITA-NA-79-10 ..... N79-32941 #
TRITA-NA-79-11 ..... N79-32942 #

TRITA-PFU-79-05 ..... N79-33064 #
TRITA-PFU-79-06 ..... N79-33065 #

TSC-PD-B571-4 ..... N79-32259 #

TUH-LRT-RT-TB-77/01 ..... N79-32444 #
TUH-LRT-RT-TB-78/3 ..... N79-32263 #

TUH-NN-14-7701 ..... N79-32550

U-6467 ..... N79-32167 #

UCID-17902 ..... N79-32693 #
UCID-17914 ..... N79-32891 #

UCLA-ENG-7931 ..... N79-33051 #

UCRL-13852-2 ..... N79-32479 #
UCRL-13860 ..... N79-32774 #
UCRL-13895 ..... N79-32279 #
UCRL-13965 ..... N79-32544 #
UCRL-52000-79-3 ..... N79-32727 #

UCRL-52508 ..... N79-32695 #
UCRL-52532-VOL-4-PT-1 ..... N79-32310 #
UCRL-80458 ..... N79-32376 #
UCRL-81206 ..... N79-33049 #
UCRL-81323 ..... N79-32517 #
UCRL-81797 ..... N79-33097 #
UCRL-81962 ..... N79-33053 #
UCRL-82513 ..... N79-33103 #
UCRL-82528 ..... N79-32398 #
UCRL-82665 ..... N79-33002 #

UDOT-SR-78/7 ..... N79-32402 #

UIEH-79-9 ..... N79-32440 #

UILU-ENG-78-2219 ..... N79-32855 #
UILU-ENG-79-2552 ..... N79-32440 #
UILU-ENG-79-2553 ..... N79-33087 #

UIO-SR-79-01 ..... N79-32791 #

UNICR-014524-8-T ..... N79-32876*#

UNICRSEL-135 ..... N79-32876*#

UNTA-IT-06-0049-79-2 ..... N79-33112 #

UNTA-HA-06-0041-79-5 ..... N79-32456 #
UNTA-HA-06-0052-78-2 ..... N79-33109 #
UNTA-HA-06-0052-78-5 ..... N79-33110 #
UNTA-HA-06-0086-78-1 ..... N79-33113 #

UNTA-HO-09-0014-79-1 ..... N79-33111 #

UNTA-WA-11-0005-79-1 ..... N79-33114 #

US-PATENT-APPL-SN-053571 ..... N79-32217*#
US-PATENT-APPL-SN-054538 ..... N79-32852*#
US-PATENT-APPL-SN-073579 ..... N79-32463*#
US-PATENT-APPL-SN-076643 ..... N79-32408*#

USAAEFA-77-31 ..... N79-32199 #

USAFESA-TSD-2060 ..... N79-32674 #

USARTL-TR-79-4 ..... N79-32178 #
USARTL-TR-79-8 ..... N79-32335 #

USATTC-78090 ..... N79-32561 #

USCAR-53-4514-1541 ..... N79-32166 #
USCAR-136 ..... N79-32166 #

USCIPI-880 ..... N79-32899 #

USGS/WRD/WRI-79/010 ..... N79-32626 #
USGS/WRI-78-102 ..... N79-32626 #

VPI-AEBO-093 ..... N79-32509 #

VPI-E-79.1 ..... N79-32499*#

VTI-145 ..... N79-33106 #

WES-TR-0-79-1 ..... N79-32878 #

WPI-53 ..... N79-32489 #

WSRL-0093-TR ..... N79-32160 #

☆U.S. GOVERNMENT PRINTING OFFICE: 1979-311-442/23

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA distributes its technical documents and bibliographic tools to eleven special libraries located in the organizations listed below. Each library is prepared to furnish the public such services as reference assistance, interlibrary loans, photocopy service, and assistance in obtaining copies of NASA documents for retention.

CALIFORNIA
University of California, Berkeley

COLORADO
University of Colorado, Boulder

DISTRICT OF COLUMBIA
Library of Congress

GEORGIA
Georgia Institute of Technology, Atlanta

ILLINOIS
The John Crerar Library, Chicago

MASSACHUSETTS
Massachusetts Institute of Technology, Cambridge

MISSOURI
Linda Hall Library, Kansas City

NEW YORK
Columbia University, New York

OKLAHOMA
University of Oklahoma, Bizzell Library

PENNSYLVANIA
Carnegie Library of Pittsburgh

WASHINGTON
University of Washington, Seattle

NASA publications (those indicated by an "*" following the accession number) are also received by the following public and free libraries:

CALIFORNIA
Los Angeles Public Library
San Diego Public Library

COLORADO
Denver Public Library

CONNECTICUT
Hartford Public Library

MARYLAND
Enoch Pratt Free Library, Baltimore

MASSACHUSETTS
Boston Public Library

MICHIGAN
Detroit Public Library

MINNESOTA
Minneapolis Public Library

MISSOURI
Kansas City Public Library
St. Louis Public Library

NEW JERSEY
Trenton Public Library

NEW YORK
Brooklyn Public Library
Buffalo and Erie County Public Library
Rochester Public Library
New York Public Library

OHIO
Akron Public Library
Cincinnati Public Library
Cleveland Public Library
Dayton Public Library
Toledo Public Library

TENNESSEE
Memphis Public Library

TEXAS
Dallas Public Library
Fort Worth Public Library

WASHINGTON
Seattle Public Library

WISCONSIN
Milwaukee Public Library

An extensive collection of NASA and NASA-sponsored documents and aerospace publications available to the public for reference purposes is maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, New York 10019.

EUROPEAN

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. By virtue of arrangements other than with NASA, the British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy of microfiche of NASA and NASA-sponsored documents, those identified by both the symbols "#" and "*", from: ESA - Information Retrieval Service, European Space Agency, 8-10 rue Mario-Nikis, 75738 Paris CEDEX 15, France.

National Aeronautics and
Space Administration

Washington, D.C.
20546

Official Business
Penalty for Private Use. $300

SPECIAL FOURTH CLASS MAIL
Book

Postage and Fees Paid
National Aeronautics and
Space Administration
NASA-451

U.S.MAIL

POSTMASTER: If undeliverable (Section 158
Postal Manual) Do Not Return